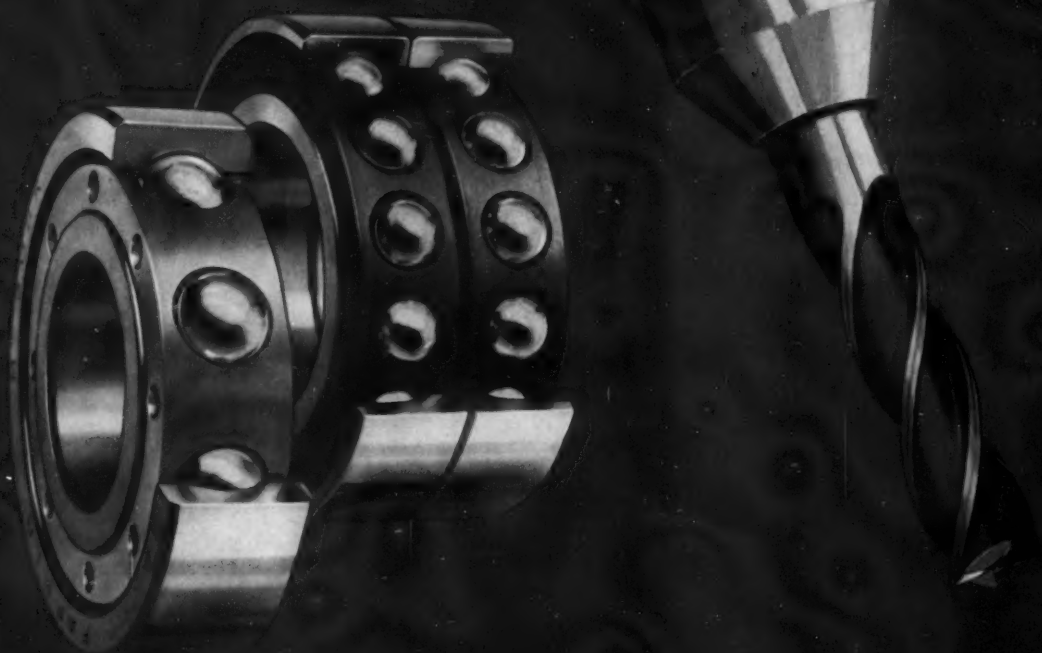
APRIL 1960—SIXTY-SIXTH YEAR

Machinery

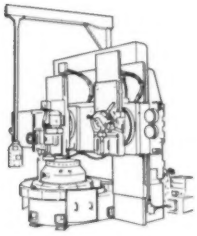


PROGRESS IN PRECISION As precision demands grow ever more critical ... and as new machine tools are needed to meet them, you can count on Fafnir to match every design advance with advanced design in super-precision ball bearings. The Fafnir Bearing Company, New Britain, Connecticut.

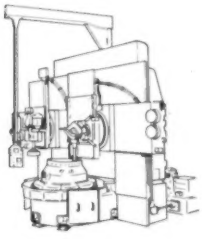
FAFNIR
BALL BEARINGS

new

from HEALD



IT PRECISION GRINDS
I.D.s, O.D.s, Tapers and Faces



IT BORES, turns, faces
grooves and chamfers

MODEL 578 VERTICAL GRINDING MACHINE

speeds rebuilding of jet engines at United Air Lines

REFINISHING big jet engine parts calls for high precision internal and external grinding, as well as a variety of rough and finish boring, turning and facing operations. United Air Lines is meeting both of these requirements to excellent advantage with the completely new Heald Model 578 Vertical Grinding Machine shown above.

With two separate and independently controlled vertical slides — one for grinding and the other for Borizing — this massive unit is really two machines in one. Either vertical slide can be positioned over the work by indexing on a common cross rail. Both vertical slides have 20 inches of travel and can be swiveled 45° to either side of the vertical position for doing angular surfaces. The grinding head can be used for I.D., O.D. or rotary surface grinding and the turret-type Borizing head accommodates up to five boring bars. The work table will take parts up to 48″ high and 52″ in diameter and can be operated at speeds from 2½ to 180 rpm.

All operating controls are centralized on a pendant control box which can be raised or lowered 24″ and swung to any area around the machine for operation from any position.

If your operations call for combined grinding and Borizing of large work, be sure to look into this radically new Heald machine. Your Heald engineer will be glad to give you complete information.

It PAYS to come to Heald

HEALD ®

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.
Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • Milwaukee • Lansing • New York • Philadelphia • Syracuse

MODERN MACHINE TOOLS MMT-PE PRODUCTION EFFICIENCY

APRIL 1960

VOL. 66 No. 8

Editor: CHARLES O. HERB

Associate Editors:
FREEMAN C. DUSTON
EDGAR ALTHOLZ
RAYMOND H. SPIOTTA
HAROLD W. BREDIN
LAURENCE W. COLLINS, Jr.

Materials Editor: PAUL B. SCHUBERT

Shop Mathematics Editor:
HENRY H. RYFFEL

Published monthly by THE INDUSTRIAL PRESS. ROBERT B. LUCHARS, *President;* EDGAR A. BECKER, *Vice-President and Treasurer;* HAROLD L. GRAY, *Secretary and Publishing Manager.* Editorial, Advertising and Circulation Offices: 93 Worth St., New York 13, N. Y. Telephone, CAnal 6-8120.

Advertising Representatives

WALTER E. ROBINSON
GORDON BRAUNINGER
93 Worth St., New York 13, N. Y.

ROBERT J. LICK
313 E. 216th St., Cleveland 23, Ohio

EMMET J. O'CONNELL
228 N. LaSalle St., Chicago 1, Ill.

NORMAN O. WYNKOOP, Jr.
44 Highland Ave., Detroit 3, Mich.

DON HARWAY & CO.
1709 W. Eighth St., Los Angeles 17, Calif.

RICHARD E. HOIERMAN
9806 Capri Drive, Dallas 18, Tex.

FRED W. SMITH
1201 Forest View Lane, Birmingham 9, Ala.

Subscription rates: United States and Canada, one year, $10; foreign countries, one year, $15; two years, $28. Single copies, $1.00; foreign, $1.50. Changes in address must be received by the tenth of the month to be effective for the next issue. Send old as well as new address. Copyright 1960 by THE INDUSTRIAL PRESS.

Accepted as controlled circulation publication at Bristol, Conn.

Great Britain
MACHINERY
National House, West St., Brighton 1, England

France
LA MACHINE MODERNE
15, Rue Bleue, Paris-IX°, France

Machinery

THE MONTHLY MAGAZINE OF ENGINEERING AND PRODUCTION IN THE MANUFACTURE OF METAL PRODUCTS

SHOP PRACTICE

Close Control of Quality—a Nuclear Age Necessity ..... Harold W. Bredin 133

"Impossible" Tools Make Dies on Production Basis .... Laurence W. Collins, Jr. 142

Optical Check-Out of Machine Tools for Missile Production ... George W. Donald 149

The ASTME Show in Detroit 165

Cut and Ground Thread Taps—9 (Data Sheet) 213

MACHINE AND TOOL DESIGN

Carbide Coating Boosts Life of High-Speed-Steel Tools ..... Charles H. Wick 146

Routing Fixture Built Around Rubber Bag 152

Drills with Chip-Breaker Ribs Reduce Hole-Making Problems 154

Drawing Machine Produces Parabolas, Hyperbolas, and Ellipses ..... Thomas R. Goulden 156

"Pre-Honed" Cutting Edges Stretch Tool Life ..... H. J. Siekmann 159

MANAGEMENT PROBLEMS

MMT = PE ..... Charles O. Herb 131

DEPARTMENTS

Keeping Up with Washington 129

Ingenious Mechanisms 156

Materials 163

Latest Developments in Shop Equipment 196

Data Sheet 213

New Catalogues 229

News of the Industry 240

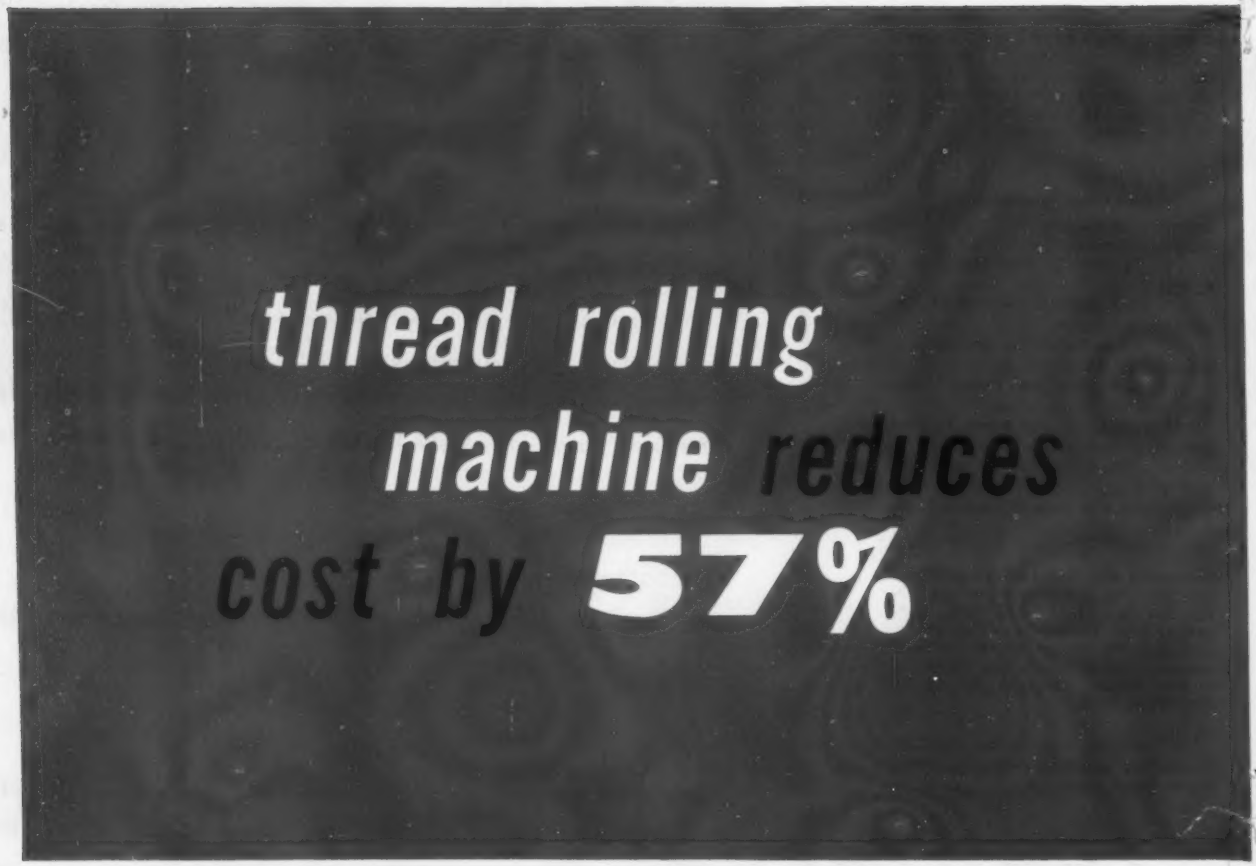
Book Reviews 246

Coming Events 246

BPA NBP

PRODUCT DIRECTORY 250

ADVERTISERS' INDEX 325



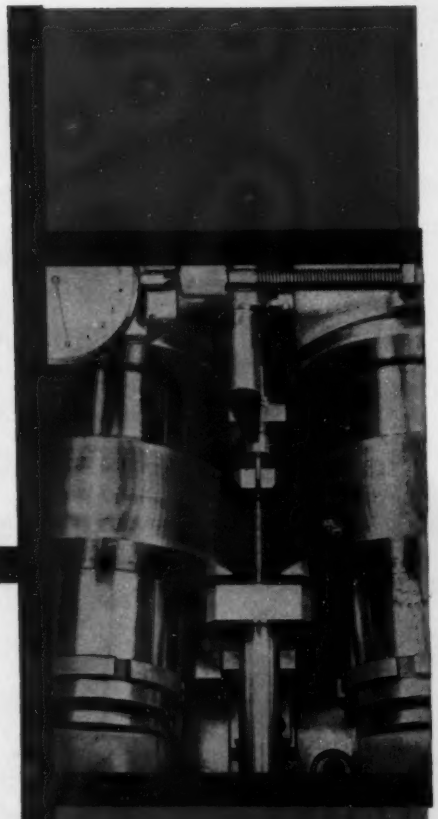
MMT-PE

BOOTH NO. 432

LANDIS Machine COMPANY WAYNESBORO • PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

The new Edison Voicewriter executive model dictating machine.



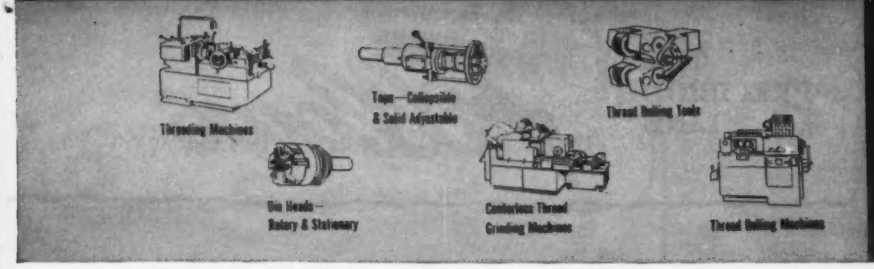
As a result of the versatility and high production of the LANHYROL Thread Rolling Machine, Thomas A. Edison Industries (McGraw-Edison Company), West Orange, New Jersey, is able to roll threads on a feed screw used in their Voicewriter dictating machine at a cost reduction of 57% as compared with having the job done by an outside vendor.

The cost-cutting benefits alone justify the purchase of the LANHYROL Thread Rolling Machine, but such things as an improved product, better able to meet exacting tolerance requirements, more efficient production control, and a reduction in materials handling and transportation cost are all advantages of rolling the part on the LANHYROL.

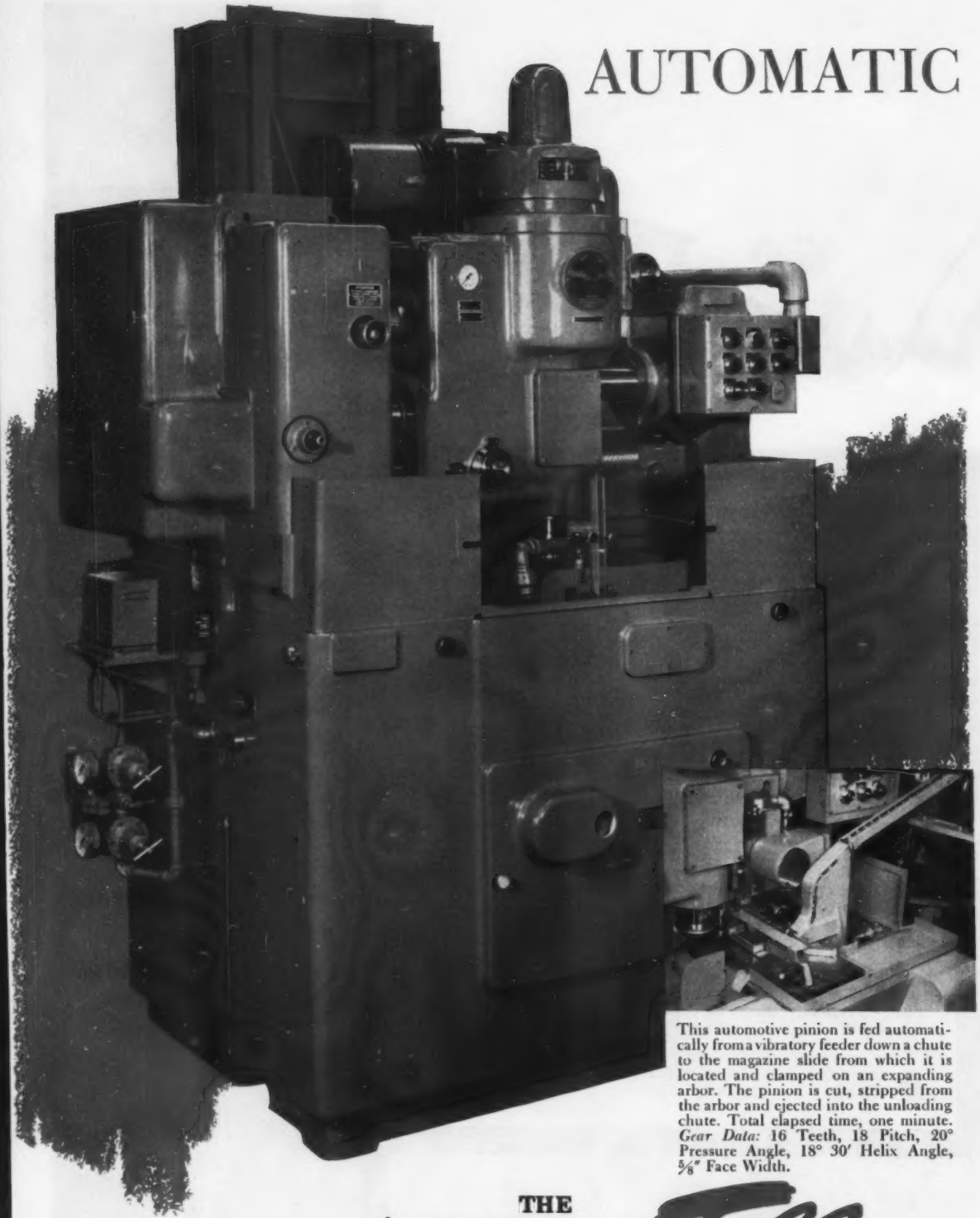
For instance, improving the product also meant a reduction in intangible costs such as a reduction in the readjustment of instruments due to variation in the previous manufacturing methods and the elimination of delays in production due to parts variations.

The LANHYROL Thread Rolling Machine produces strong, accurate threads of excellent finish by the chipless, cold-forming process using three different Rolling methods—Infeed, Thrufeed (as in this operation), and Continuous as required by conditions of workpiece design, material hardness or thread specifications. It will thread all diameters from 3/16" to 3", producing left-hand and right-hand threads of all types (except square), including UNC, UNF, Acme, worm, and many special forms. In addition to wide range coverage, the design provides a means for rapid size adjustment and versatility of application. Completely automated threading operations can also be obtained by hopper or magazine feeding.

Please send your specifications and let us show you how you can realize the cost saving benefits of the LANHYROL Thread Rolling Machine. Ask for Bulletin E-60.



AUTOMATIC



This automotive pinion is fed automatically from a vibratory feeder down a chute to the magazine slide from which it is located and clamped on an expanding arbor. The pinion is cut, stripped from the arbor and ejected into the unloading chute. Total elapsed time, one minute. *Gear Data:* 16 Teeth, 18 Pitch, 20° Pressure Angle, 18° 30′ Helix Angle, 5/8″ Face Width.

THE PRECISION LINE

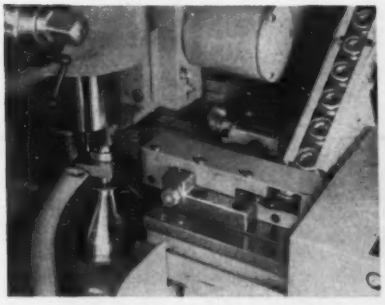
Fellows

WORK HANDLING
Is A Natural Complement to the High Production Rates of the Fellows 4GS Gear Shaper

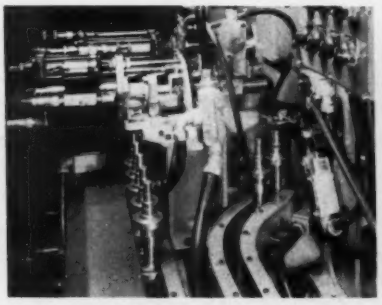
Although designed for both manual and automatic loading, the 4GS Fellows Gear Shaper makes best use of its high production rates when equipped with work handling devices.

The physical construction of the machine is such that it may be easily adapted for use with magazines and chutes for automatic loading and unloading at substantial cost savings on continuous production runs.

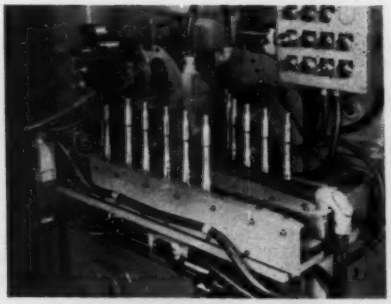
Ask your Fellows representative about the many advantages of automatic work handling with the 4GS Fellows Gear Shaper, or write direct to the Fellows Gear Shaper Company.



These internal clutch parts are handled in the same manner as the 16-tooth external pinion, except that the cutter-spindle is automatically stopped at the top of its stroke for clearance during the loading and unloading cycle. Cutting time is 1½ minutes. *Gear Data:* 10 Teeth, 12.4 Pitch (Stubbed), 30° Pressure Angle, Spur, 5/32" Face Width.



This transmission cluster gear shaft is handled by two sets of air-operated "fingers" mounted on a turret. As the turret rotates, one set of fingers moves the finished piece to the unloading chute while the other set brings the new blank into position. Cutting time is 35 seconds. *Gear Data:* 10 Teeth, 12.4 Pitch (Stubbed), 30° Pressure Angle, External Spur, 5/32" Face Width.



This automotive stem pinion is handled in the same manner as the cluster gear. In both cases, safety devices prevent the machine from starting unless the blanks are in the correct cutting position. Loading and unloading chutes may be hand or conveyor fed. Cutting time is 2½ minutes. *Gear Data:* 17 Teeth, 10 Pitch, 19° 30′ Pressure Angle, 32° 51′ Helix Angle, 5/8" Face Width.

Gear Production Equipment

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont, U. S. A.
Branch Offices:
1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45

For more data circle this page number on card at back of book

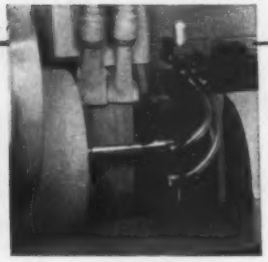
New CINCINNATI 4″ Super

gives you ultra-high accuracy

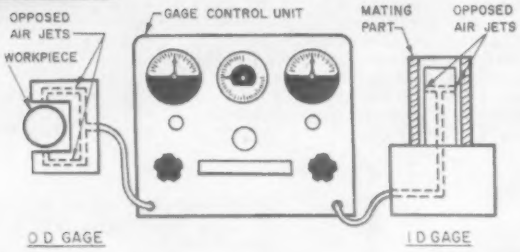
Here is a machine designed and constructed for just one purpose... ultra-precision grinding. On the new CINCINNATI 4″ Super Precision Grinder, tolerances for size, roundness, straightness and surface finish are obtained *within a few millionths of an inch,* on a semi-automatic production basis. This extreme accuracy has many applications for grinding critical parts, such as missile control valves, fuel injector plungers, and a variety of other mating or shaft-like parts.

For maximum stability the new 4″ Super Precision Grinder incorporates heavy duty castings with extra ribbing. All alignments and center heights are held to tolerances approaching the vanishing point. Motors are super balanced, and both cutting fluid and hydraulic tanks are isolated from the machine to eliminate vibration. A special dual rate automatic infeed unit provides rates as low as .0002″ per minute. Cincinnati's Gage-Line unit assures extremely accurate taper adjustment, without trial and error or bothersome calculations; footstock tension adjustment and temperature are regulated with equal precision.

Cincinnati's exclusive Grind-A-Mate gaging system completely controls the automatic grinding cycle. Parts may be matched ground to preset clearances throughout prolonged production runs, regardless of diameter variations. Our Grinding specialists will be glad to provide further information regarding your particular application. Complete details may be obtained by writing for new Catalog G-730.



CINCINNATI'S EXCLUSIVE GRIND-A-MATE GAGING SYSTEM *controls the entire automatic grinding cycle. Air jet gages continuously measure both the OD of workpiece as it is precisely ground (at left), and the ID of the mating part; and constantly indicate on a high amplification differential meter (below) the variation between the two diameters. Desired clearance between mating parts is preselected by operator on one dial.*

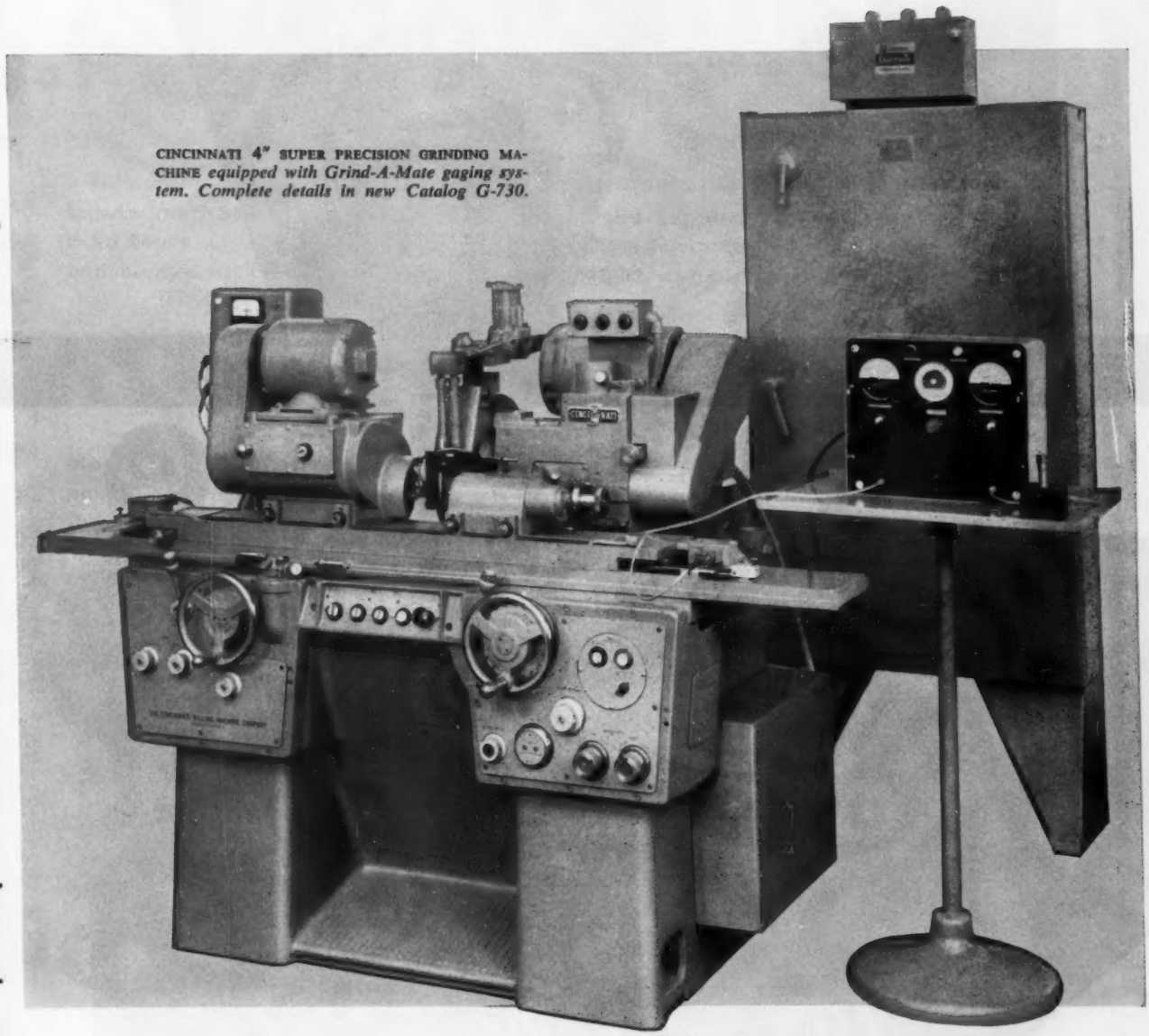


BUILDERS OF PRECISION GRINDING MACHINES: CENTERTYPE • CENTERLESS • MICRO-CENTRIC

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

Precision Grinder

in matched grinding



CINCINNATI 4" SUPER PRECISION GRINDING MACHINE *equipped with Grind-A-Mate gaging system. Complete details in new Catalog G-730.*

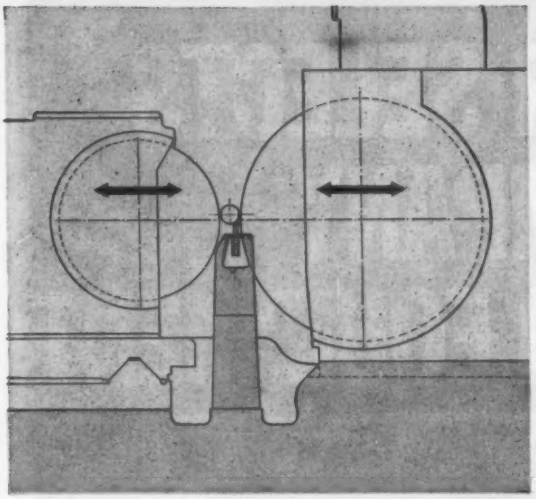
• ROLL • CHUCKING • CENTERLESS LAPPING

CINCINNATI®
GRINDING MACHINE DIVISION

For more data circle this page number on card at back of book

Exclusive Landis work rest design gives high

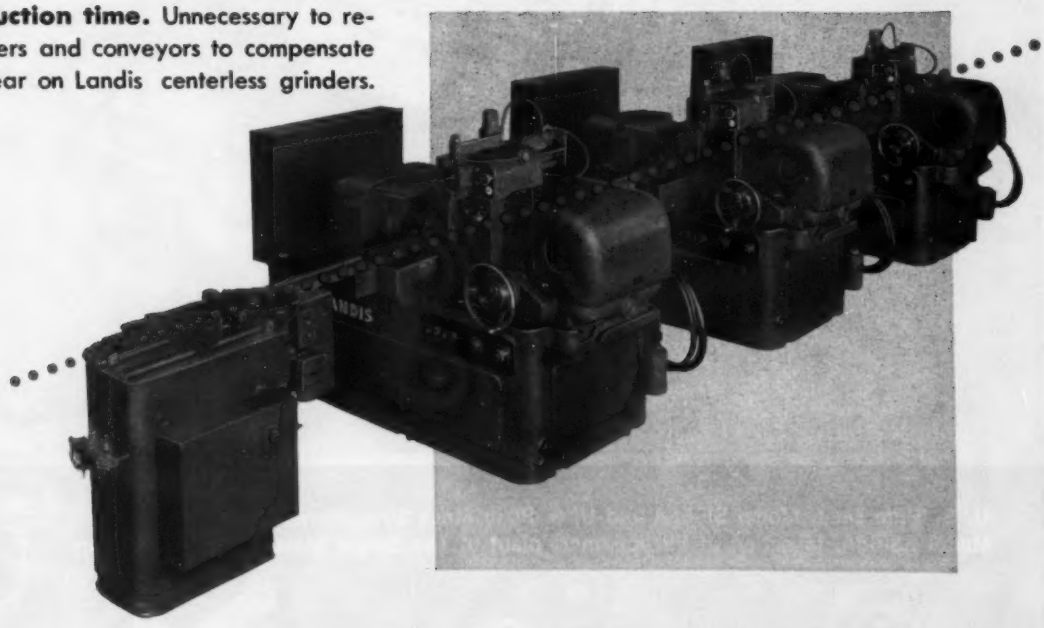
centerless output *plus* close tolerances



Landis method of centerless grinding. Extra heavy cuts can be taken with this rigid, bed mounted work rest.

Solid support for accuracy and finish. Close tolerances and fine finishes maintained at high production rates.

More production time. Unnecessary to reposition loaders and conveyors to compensate for wheel wear on Landis centerless grinders.



MMT PE

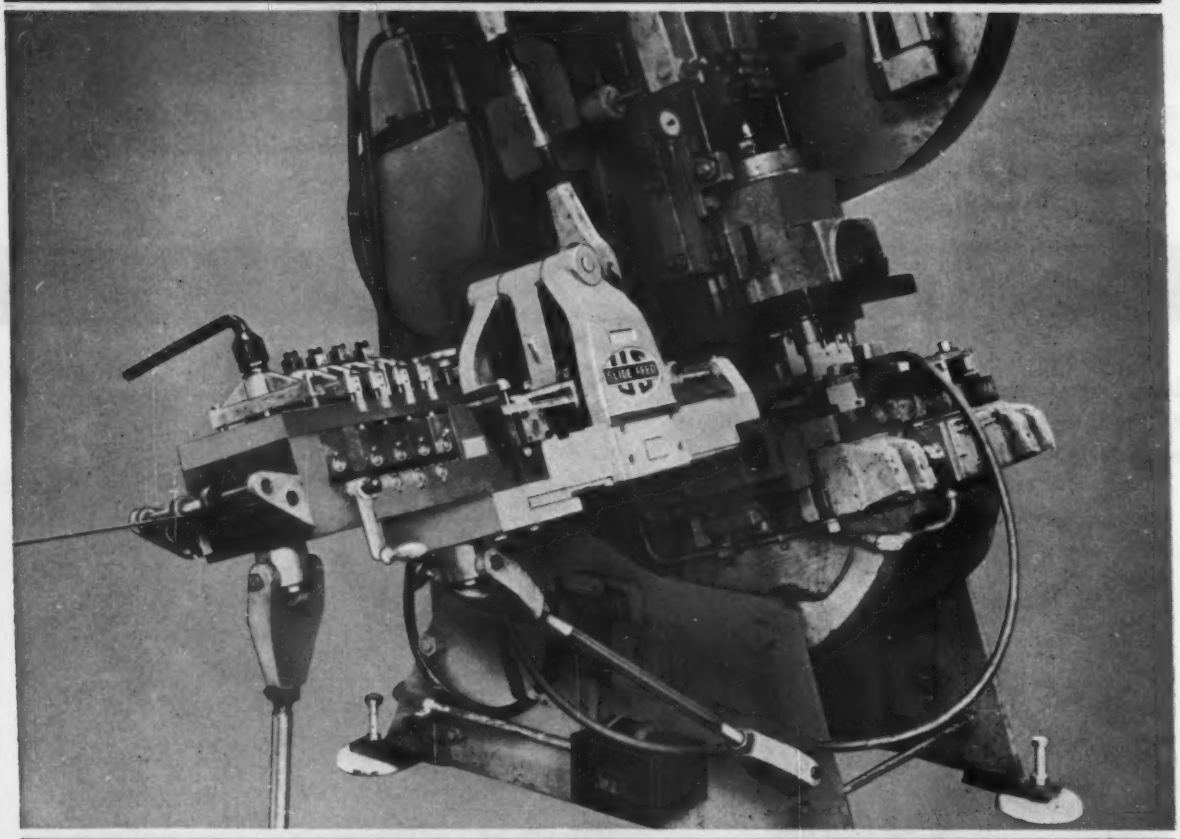
LANDIS TOOL COMPANY

WAYNESBORO, PENNSYLVANIA

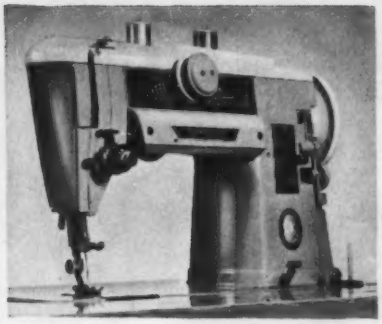
LANDIS

precision grinders

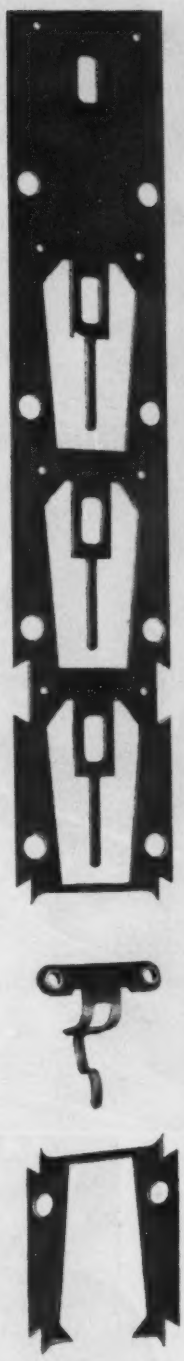
SINGER SELECTS U.S. TOOL COMPANY PRESS ROOM EQUIPMENT



U. S. Slide Feed, Model SF-68A and U. S. Plain Stock Straightener, Model SS-68A, in action at Elizabethport plant of The Singer Manufacturing Company.



Progressive strip showing extreme accuracy maintained by U. S. Slide Feed through this 5 stage operation.



The Singer Manufacturing Company successfully combines rapid output **and** critical quality control in the production of stampings used in the famous SLANT-O-MATIC* sewing machine.

In their Elizabethport, New Jersey plant, Singer uses U. S. Slide Feed, Model SF-68A, and U. S. Plain Stock Straightener, Model SS-68A, to feed coil stock into a 5 stage progressive die to produce perfect Thread Guides. Stock for the Thread Guide is 1010 cold rolled steel, in coils, 1⅜" wide and .045" thick. Feed length is 1¾".

The accuracy of this feed increases production — cuts rejections to the absolute minimum and provides the SLANT-O-MATIC machine with a finished component worthy of this fine machine.

To achieve greater efficiency and economy in your own stamping operations, investigate U. S. Press Room Equipment.

Write for Bulletins 85M and 151M.

U. S. TOOL COMPANY, INC.

VISIT OUR BOOTH '60 ATE TOOL SHOW

BOOTH 1520

PRODUCTS

U.S. TOOL COMPANY, INC.

AMPERE (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

*SLANT-O-MATIC IS A TRADEMARK OF THE SINGER MFG. CO.

Here's how the new No. 4 permitted an improved machining method on the "bottom checks"... B-I-F's older machines had hand-operated collet chucks and bar feeds which required a turret station for a stock stop. In addition to the stock stop, six additional turret faces were required for the tooling, but only five stations were open. This meant that a quick change holder had to be placed on one turret face. For each part produced, a manual exchange of tooling had to be made in this one turret station. This was not only a fatiguing operation, but occasionally confused the operator as to which tool was in place, resulting in an occasionally scrapped part.

However, longitudinal feeding accuracy of the No. 4's hydraulic bar feed eliminated the need for a hex turret stock stop and thus opened up one more face on the turret—eliminated the hand exchange of tooling.

At B-I-F INDUSTRIES, INC.

Providence, Rhode Island

Modernization with Warner & Swasey No. 4 Turret Lathe saves FOUR minutes per piece on this "Bottom Check"

In this case, the new machine permitted an improved tooling method which combined to reduce first operation machining time from 10 to 6 minutes!

At B-I-F INDUSTRIES a wide variety of jobs are machined in lot sizes varying from 50 to 200 pieces—some special runs require only 3 or 4 pieces. Materials machined cover an equally broad range—from free-machining brass to various grades of stainless, Monel and Hastelloy.

B-I-F made a 31-week study of the new No. 4 versus their older No. 4's. The result showed substantial production increases on all types of machining jobs.

Machine features helping to effect these production time and cost savings include:

- **Handling ease of the machine—each model Warner & Swasey is individually designed for a specific range of work.**
- **Ease and simplicity of speed preselection and engagement—new all-clutch headstock design encourages use of the correct speed for every cut.**
- **Ability of the No. 4 to hold tolerances from .0005 to .001-inch total—helped eliminate subsequent finishing operations.**
- **Vibration-free running of constant mesh gear train headstock—substantially improved cutter life, permitted 32 to 63 micro-inch surface finishes to be easily held.**

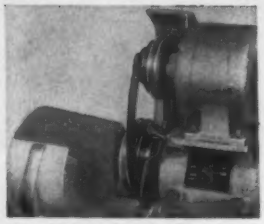
Check today with your Warner & Swasey Field Representative and see how these versatile No. 4 Ram Type Turret Lathes can fit into your production picture—increasing production, boosting profits.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

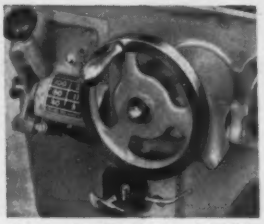
YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

For more data circle this page number on card at back of book

All industry is talking about the new Van Norman



Headstock Speed Changes—V-belt drive to jack shaft provides four work speeds from 153 to 940 RPM through four-step pulleys. Opening guard releases belt tension, makes work head speed changes easy.



Conveniently Grouped Table Traverse Controls—Controls at left include table traverse selector, handwheel, table start-stop lever, one shot lubrication lever—all easily reached by operator. Start-stop lever disengages hand-wheel when power travel is used.

K&K CUTS SMALL PART GRINDING TIME 50% ...MAINTAINS .0003 TOLERANCE

K&K Grinding Company cut small part production time in half when they switched to VN 418 Cylindrical Grinders. Specifically designed for fast precision traverse or plunge grinding of small parts, this VN machine gives repetitive accuracy and finish to small parts requiring a tolerance of .0003 or less. And it's easily changed over from one job to another.

4 Headstock Speed Changes—The VN 418 features V-belt drive to jack shaft, providing four work speeds from 153 to 940 RPM through four-step pulleys. Opening guard releases belt tension . . . makes work head speed changes easy.

Conveniently Grouped Table Traverse Controls—All controls . . . table traverse selector, handwheel, table start-

VAN NORMAN

SPRINGFIELD 7, MASSACHUSETTS

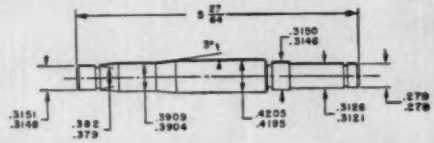
VN 418 Cylindrical Grinder doubles grinding output of plug gages and small instrument shafts... easily changed over from one job to another... assures repetitive accuracy and finish.

stop lever, one-shot lubrication lever . . . are easily reached by the operator. Start-stop lever disengages hand-wheel when power travel is used.

Get Detailed Information—Your local VN Franchised Distributor is ready to show you how the VN 418 Cylindrical Grinder can cut your production time . . . and costs. Call him *today*.

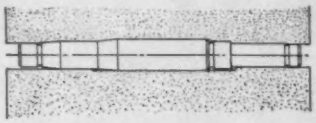
And here is a typical Van Norman centerless grinder cost-saving application

CUSTOMER'S PROBLEM:



A prominent electric motor manufacturer had the problem of reducing the cost of grinding the rotor shaft used in their small motors. They were grinding the shaft in (2) operations because they were unable to hold required tolerances when attempting to grind in one operation. Automatic loading and unloading was to be considered.

VAN NORMAN SOLUTION:



A VN DIVERSIMATIC with Automatic Loading and Unloading Device—Due to the built-in accuracy of a Van Norman Diversimatic the machine was arranged to grind the entire length of the rotor shaft in (1) operation with the machine equipped for automatic loading and unloading mechanism. The preliminary estimate was: the machine would grind 600 pieces per hour at 100% efficiency. Formerly, the top performance on this job had been 300 pieces per hour. A loading fixture capable of holding approximately 300 shafts in a magazine was designed. This was so arranged that it would load one piece at a time between the wheels, grind and eject to the back of the machine at the guaranteed rate.

THE RESULT:

The machine produced as designed. Holding all tolerances and although customer would accept .0003 runout when part was rotated on journals, Van Norman ground in production parts with run-out not exceeding .00015. Van Norman built-in rigidity paid off again.

MACHINE COMPANY

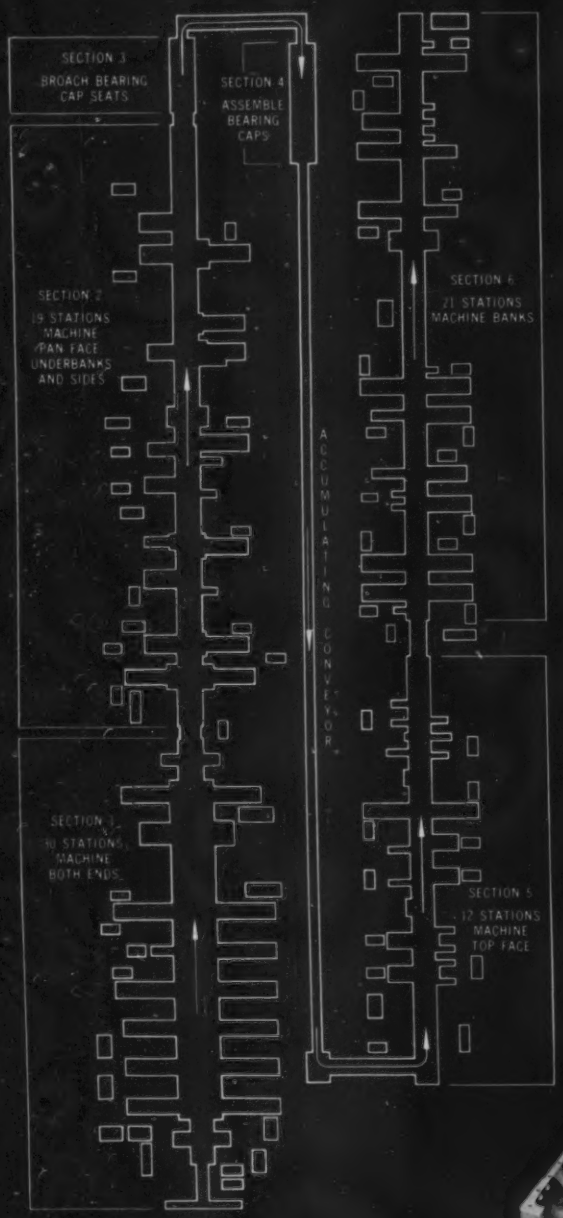
A DIVISION OF VAN NORMAN INDUSTRIES, INCORPORATED

VN

2282

For more data circle this page number on card at back of book

V-6 and V-12 Engine Blocks Processed on ONE Transfer-matic



Floor plan layout of the sectionized Transfer-matic. The illustration on the right is Section 1 and 2.

New concepts of production flexibility are engineered into this new Sectionized Transfer-matic created to machine engine blocks for a new family of large V-6 and V-12 truck engines. 579 boring, reaming, tapping, chamfering and spotfacing operations are performed on the V-6 parts and 901 on V-12's. Of these, 454 are common to both parts.

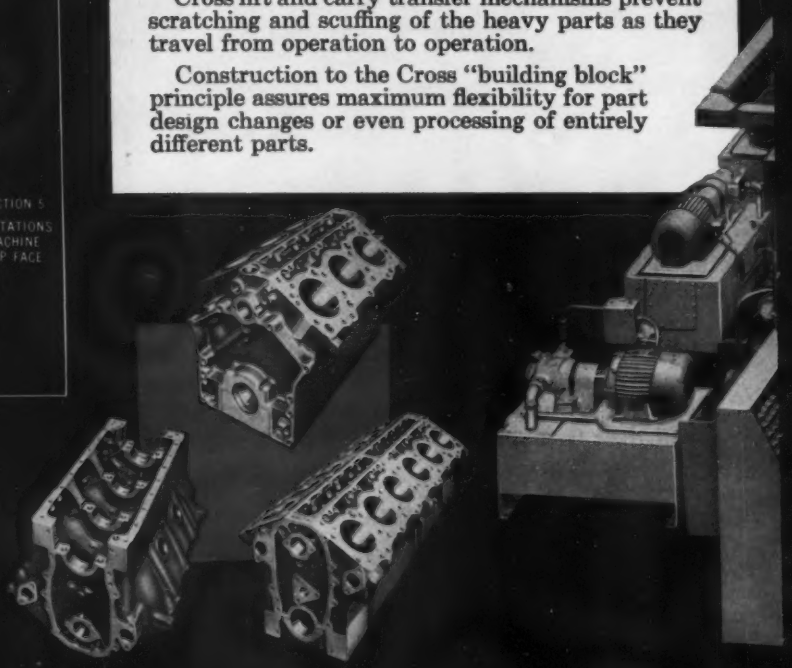
The uncommon operations are taken care of with standby spindles and machine units, and with a novel two-step transfer mechanism which reduces the number of spindles required to machine the V-12 by approximately 50%. The transfer mechanism, where applied, allows the V-12 to make two stops under each multiple head (heads have only enough spindles to process the V-6). At the first stop, the front half of the V-12 is machined, and at the second stop, the rear half. V-6's move through the machine in a conventional manner stopping under each head only once.

Capacity of the line operating at 100% efficiency is 65 V-6 blocks per hour, or 35 V-12's.

The line is divided into sections with provisions for banking between each section. Thus, it is possible to be producing V-6's in some sections, V-12's in others and to be making a changeover in still another section, all at the same time.

Cross lift and carry transfer mechanisms prevent scratching and scuffing of the heavy parts as they travel from operation to operation.

Construction to the Cross "building block" principle assures maximum flexibility for part design changes or even processing of entirely different parts.

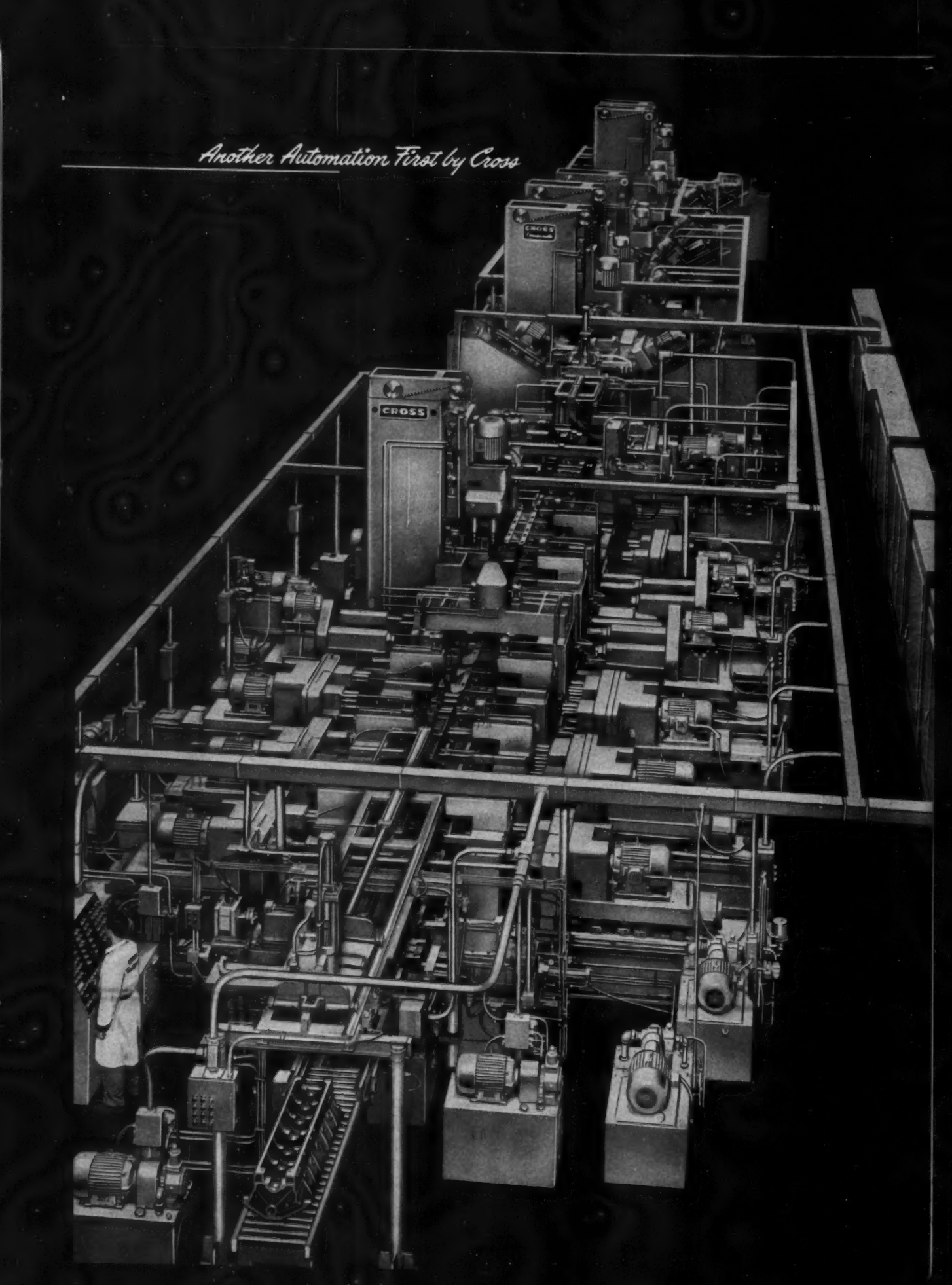


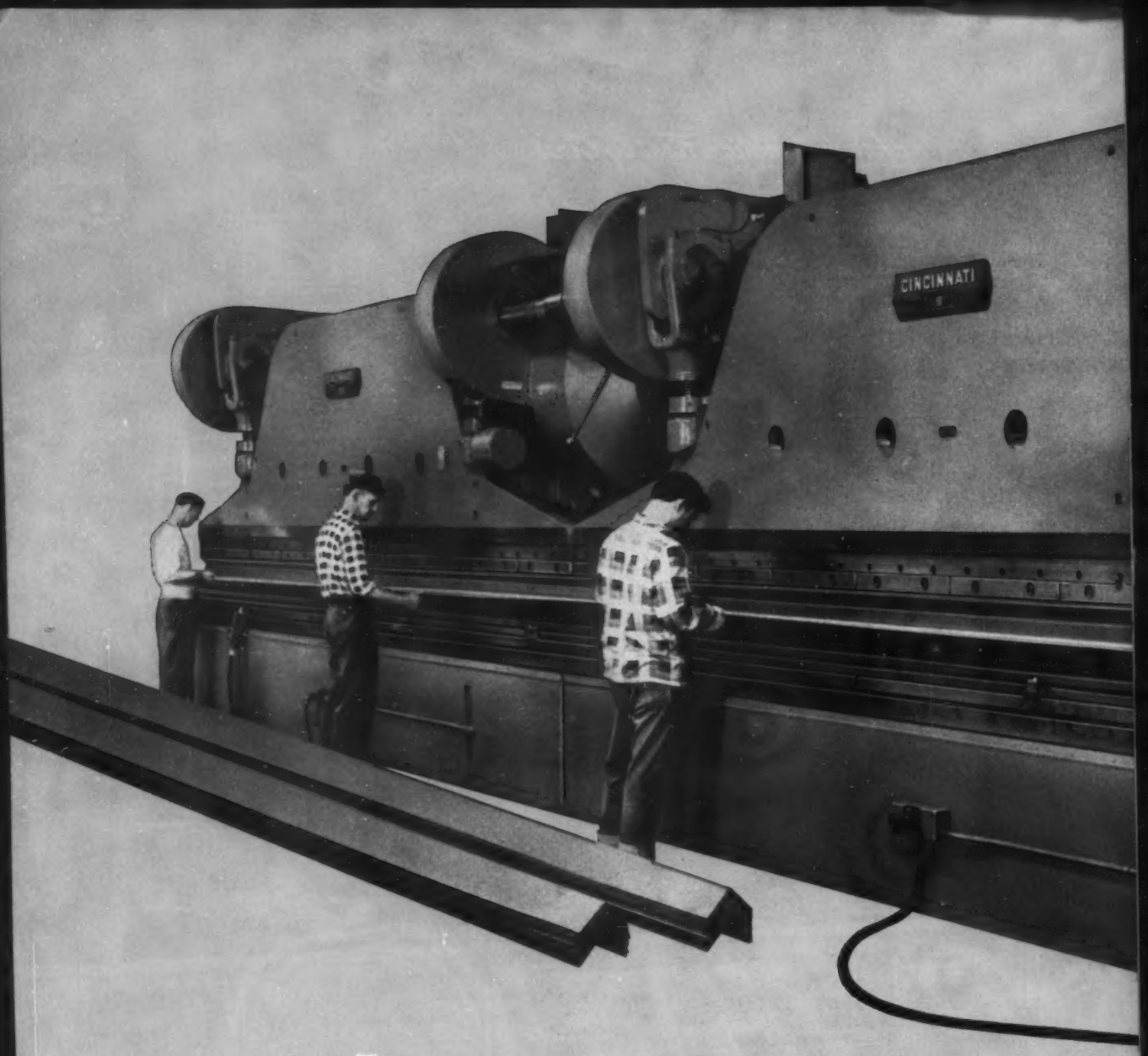
Established 1898

THE CROSS CO.

First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN

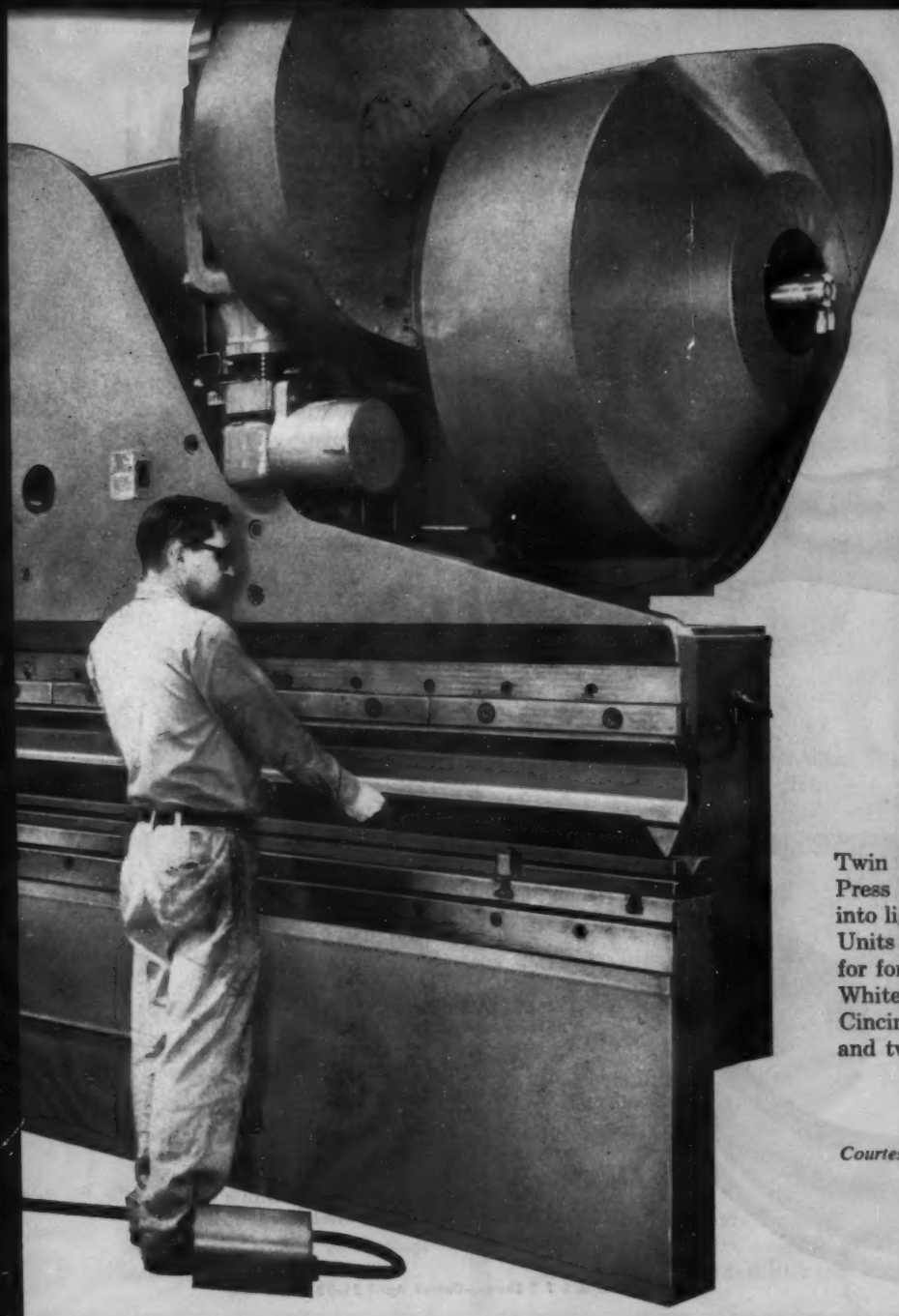

Another Automation First by Cross
CROSS



CINCINNATI® AUTOMATIC CYCLE PRESS BRAKE

improves

These twin Cincinnati Automatic Cycle Press Brakes have increased production "by 33% or more" and opened up lucrative new markets for the Whiteway Manufacturing Co., makers of outdoor lighting equipment.



Twin Cincinnati Automatic Cycle Press Brakes bend ¼-inch steel into light poles up to 40′ long. Units can be operated individually for forming poles up to 20′ long. Whiteway also has two more Cincinnati Press Brakes and two Cincinnati Shears.

Courtesy Whiteway Manufacturing Co., Cincinnati

production 33%

According to Whiteway President Joseph H. Spaulding, "Even an experienced operator, skilled at jogging the ram down on a conventional machine, can't match the speed of these Automatic Cycle Press Brakes. "I wouldn't consider buying another press brake without Automatic Cycle."

Buying these machines enables Whiteway to enter new markets in outdoor lighting which require poles up to 40 feet long.

THE CINCINNATI SHAPER CO.

Shapers / Shears / Press Brakes / Cincinnati 11, Ohio, U. S. A.

In Scotland: The Cincinnati Shaper Co., Ltd., Glasgow

New ARMSTRONG Swivel Pad can't come off

Now ARMSTRONG deep throat "C" Clamps have the new (Pat. apd. for) ARMSTRONG Ball-joint Swivel Pad. This "C" Clamp pad, developed by ARMSTRONG Engineers, is tougher than any on the market. Rigorous testing in our own plant first proved this fact, and field tests in factories throughout the country have confirmed our own test results.

Here's Why it's STRONGER . . .

The lip of the opening in the ARMSTRONG Ball-joint Swivel Pad is undercut so that when the ball of the screw is inserted, and the lip is permanently forced down, a solid steel wall is formed, inside the pad cavity, completely encircling the ball.

This wall of steel makes it impossible for the pad to come off the screw during normal use. In fact, our tests have proved that it is virtually impossible to intentionally knock the pad off with a hammer —yet the pad is free to swivel through an arc of approximately 40°.

See us at A S T E Show—Detroit April 21-28 Booth 760

Call your ARMSTRONG Distributor

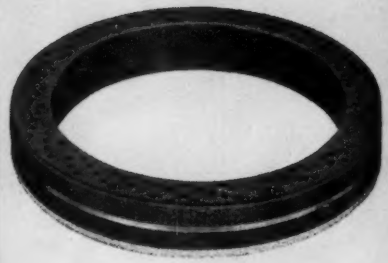
Your ARMSTRONG Distributor can offer delivery from stock on this "400-Series" deep throat, drop-forged "C" Clamp with the new Ball-joint Swivel Pad. He also carries in stock the other styles of clamps in the ARMSTRONG Line—the broadest line of drop forged "C" Clamps.

ARMSTRONG BROS. TOOL CO., 5213 W. ARMSTRONG AVE. CHICAGO 46, ILLINOIS

Wide variety of Gardner abrasives assures top performance in all surfacing operations

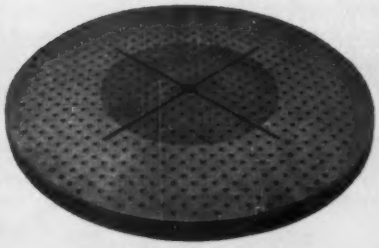
Segmental Wire-Lokt® discs for large horizontal grinders

Smooth faced Wire-Lokt discs for general purpose grinding



Narrow face disc with corrugations for cool cutting

Cylinder wheels for use on most popular types of vertical spindle grinders



Combination grade and face with radial lines for even wear and better coolant distribution

Cylinder wheels with square centers for fast stock removal on large areas

range of disc sizes

	diameter	thickness
regular disc	10″ to 48″	1″ to 3″
segmental disc	53″ to 84″	1″ to 3″
cylinder wheel	11″ to 32″	4″ or 5″
square center cylinder wheel	18″ & 20″	4″ or 5″

MMT PE

For a review of your flat surface grinding operations, call your Gardner Abrasives Specialist today.

GARDNER

abrasive discs

BELOIT, WISCONSIN

GRAY + NORDEN

Extensive product research showed Norden system of numerical control superior to any contemporary system for Gray horizontal boring machines and milling planers. Jointly developed by Gray and Norden expressly for machine tool application, the Gray space setter's unique features make it the most sought after control of its kind.

Compare these salient features:

- Read-out. A visual display clearly indicating at all times the exact location of a machine tool element.
- Zero Off-set. Ability to establish zero read-out on the display at any predetermined reference point on the work piece. Operator then reads drawing dimensions on display unit.
- Work to closer accuracies. Overall accuracies within .001". Unaffected by line voltage.
- Greatest productivity over prolonged period. Replaceable modular construction facilitates quick servicing.
- Progressive steps to full tape control. Each phase may be purchased individually.

The G. A. GRAY Co. Cincinnati, Ohio

Builders of—Planers • Milling Planers • Planer type Milling Machines • Horizontal Boring Machines

= space setter

HARDINGE STOCKS COLLETS . . . .

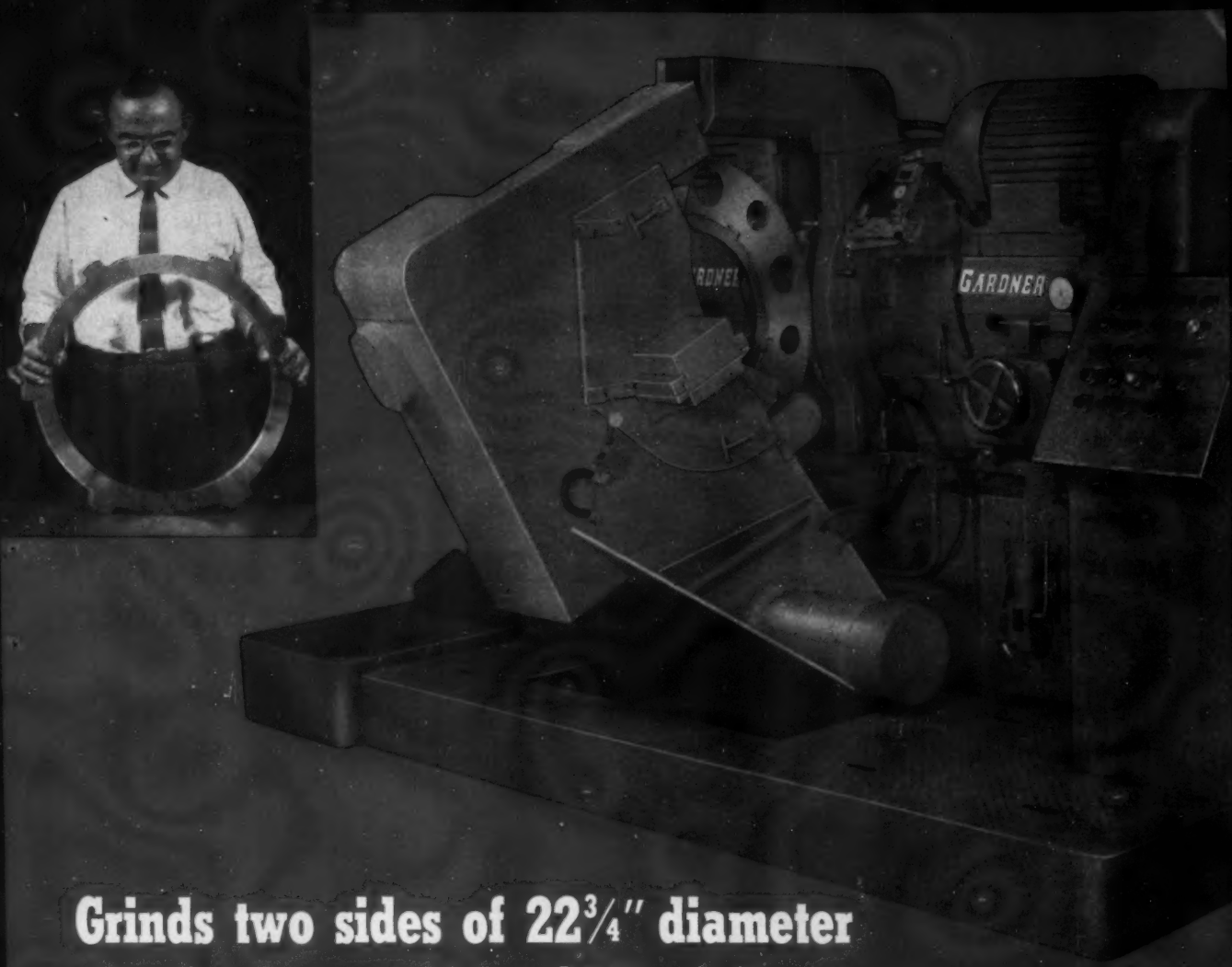
. . . . . AT ELMIRA, N. Y.

AND **COLLETS** AT ATLANTA, GEORGIA
AND **COLLETS** AT BOSTON, MASS.
AND **COLLETS** AT CHICAGO, ILLINOIS
AND **COLLETS** AT DAYTON, OHIO
AND **COLLETS** AT DETROIT, MICH.
AND **COLLETS** AT HARTFORD, CONN.
AND **COLLETS** AT LOS ANGELES, CALIF.
AND **COLLETS** AT NEW YORK CITY
AND **COLLETS** AT PHILADELPHIA, PA.
AND **COLLETS** AT OAKLAND, CALIF.
AND **COLLETS** AT MINNEAPOLIS, MINN.
AND **COLLETS** AT ST. LOUIS, MO.
AND **COLLETS** AT SPRINGFIELD, N. J.
AND **COLLETS** AT ROCHESTER, N. Y.
AND **COLLETS** AT PORTLAND, OREGON
AND **COLLETS** AT SEATTLE, WASH.
AND **COLLETS** AT TORONTO, CANADA
ALSO **FEED FINGERS and PADS**

IN THESE LOCATIONS FOR IMMEDIATE DELIVERY

HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.

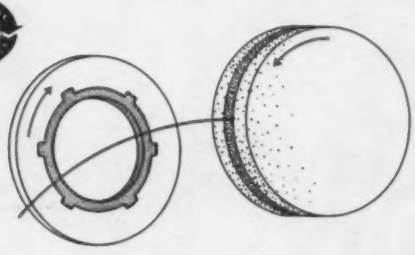
CARRIED IN STOCK FOR PROMPT DELIVERY IN: Atlanta, Boston, Chicago, Dayton, Detroit, Elmira, Hartford, Los Angeles, New York, Philadelphia, Seattle, Portland, Minneapolis, Oakland, St. Louis, Toronto.



Grinds two sides of 22¾" diameter clutch plates within .005" of flat

production data

Machine	Gardner 2H30-30" Double Spindle Disc Grinder
Operation	Rough and finish grind
Diameter	22¾" O.D. x 17⅝" I.D.
Production	30 parts per hour per cut
Stock removal	.058" to .065" overall, rough and finish
Tolerances	Flatness: .005"
	Parallelism: .0005" to .001"
	Uniformity: .002"
	Finish: 40 RMS



Standard double spindle disc grinder with special work fixturing grinds two sides in one operation

This swinging arm fixture handles a wide range of clutch plate sizes by simple change of the work carrier. The same fixturing principle can be applied to other large diameter parts.

Send us your prints for a practical solution to your disc grinding problems.

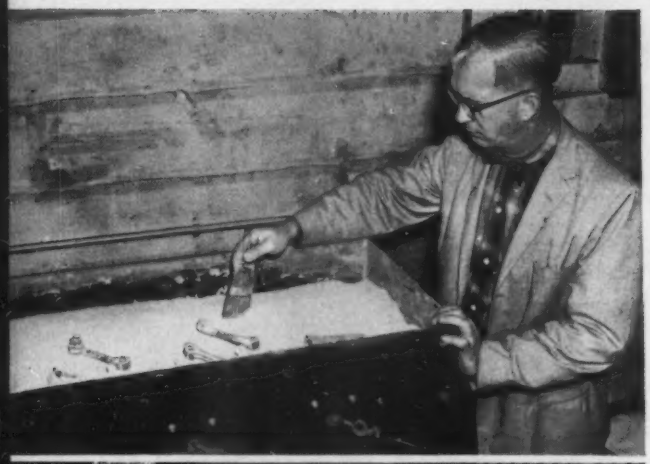
GARDNER

precision disc grinders

BELOIT, WISCONSIN

Allis-Chalmers uses **RYKON** *Grease in bearing shield—offers farmers better disc harrow*

can **RYKON** Grease help you improve your product?



Above: Maynard Walberg sweeps sand back over disc harrow bearings on test stand. RYKON Grease is undergoing 2,000-hour test in this simulation of actual farm service conditions.

Below: Allis-Chalmers disc harrow ready for shipment from the plant gets inspection from Standard's Fred Parkinson and Walberg.

Maynard Walberg, Allis-Chalmers project engineer, and Standard Oil lubrication specialist Fred Parkinson, examine disc harrow bearing assembly. Fred is well equipped through training and experience to help industrial customers with lubrication problems. He has been doing this work for 11 years at Standard. He has a degree in chemistry and engineering from Brown University. Plus that, he has completed the Standard Oil Sales Engineering School.

Situation: Bearings of a disc harrow in service are always turning in dusty conditions, oftentimes completely covered with soil. Such bearings in the Allis-Chalmers harrow are protected with grease-coated rubber shields. The grease guards against dirt getting past the shield and into the bearing.

What was done: Allis-Chalmers project engineer in the LaCrosse, Wisconsin plant, Maynard Walberg, called Fred Parkinson, Standard Oil lubrication specialist, for a sample of RYKON Grease. In conditions simulating field service, RYKON Grease was tested. Bearings were rotated in the most abrasive dirt available—Mississippi sand with a high quartz fraction.

What happened: Tests were started and run to destruction. Prior to the use of RYKON Grease, bearing failures occurred at 500 hours. On switching to RYKON Grease, these tests were pushed to 2,000 hours. At this point, tests were stopped. Bearings were still in operating condition.

What you can do: Find out how RYKON Grease might help you offer your customers a better product. Inquire of the Standard Oil lubrication specialist nearest you anywhere in the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 So. Michigan Ave., Chicago 80, Ill.**

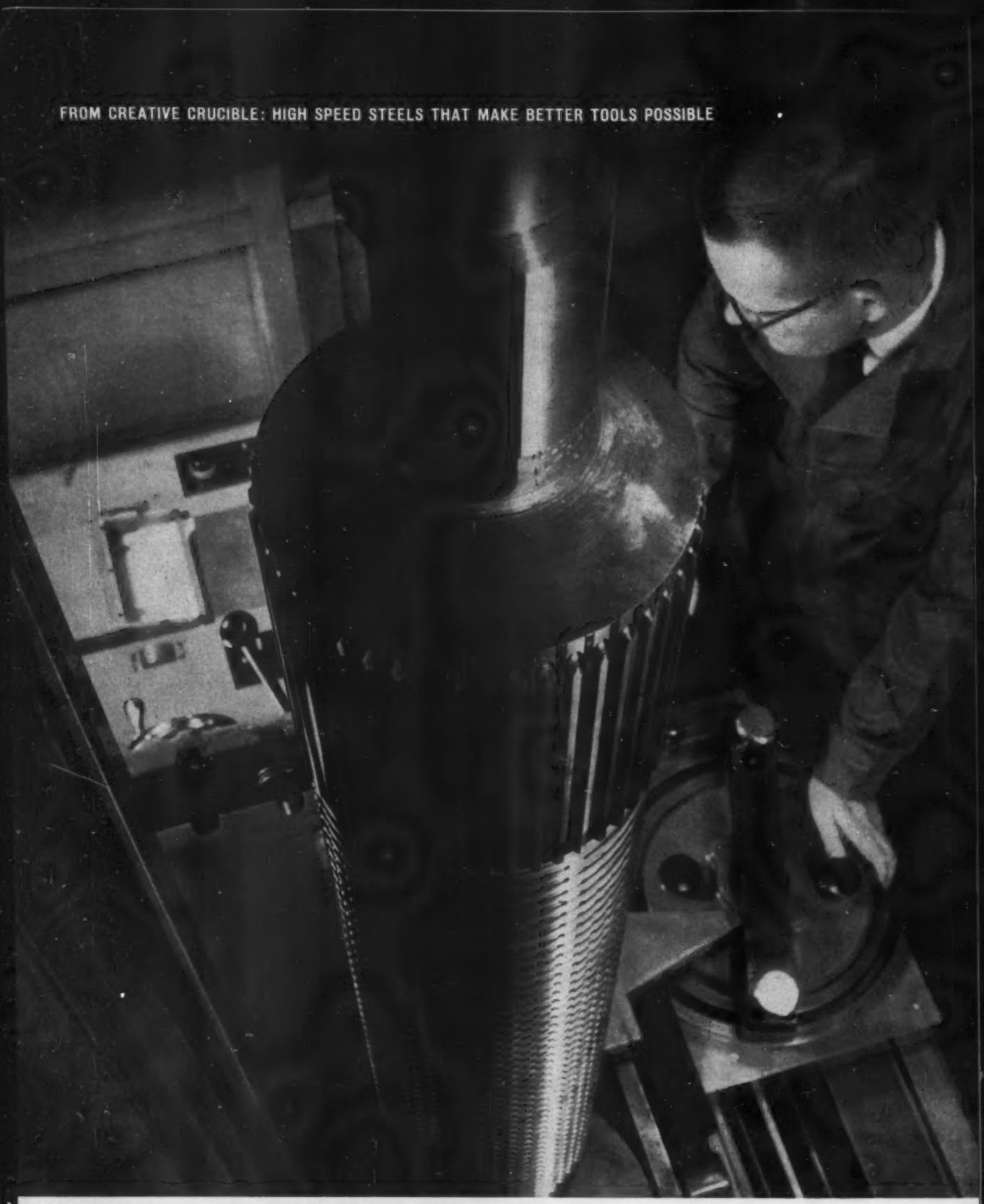
STANDARD

You expect more from STANDARD and you get it!

Quick facts about RYKON

- Heat stable. At sustained high temperatures RYKON Grease remains soft and grease-like.
- Resistant to water-washing.
- Mechanically stable. Minimum change in consistency in service.
- Resistant to oxidation. Thickener acts as an inhibitor.
- Exceptional rust-preventive properties.

FROM CREATIVE CRUCIBLE: HIGH SPEED STEELS THAT MAKE BETTER TOOLS POSSIBLE



CHECKING THE INVOLUTE PROFILE OF A SPLINE BROACH. Broach's 6" pitch diameter is designed to cut 48 splines—hold accuracy of +.0002"-.000" on all splines for 30". This accuracy is possible on broaches up to 82" when made of Rex High Speed Steel.

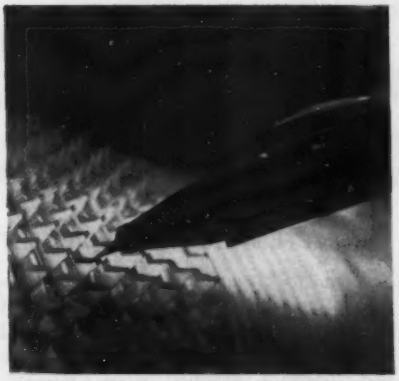
NOW, BROACHES PRODUCE MORE PIECES FASTER

They're also producing pieces with finer finishes and greater accuracy – because they're made of continually-improved Rex® High Speed Steels.

New broach designs and new broaching machines now enable you to mass-produce complex shapes in a matter of minutes. Furthermore, every piece is finely finished to within micro-inch tolerances.

What is behind this development? It's the increased skill of the broach tool makers, combined with Crucible's progress in making better high speed steels.

To produce the fine steels needed for broaches, Crucible tool steel specialists make use of the most advanced electronic instrumentation available today. For example: they use precision instruments to control the temperature of the molten metal in the melting furnace. So, each heat is produced under identical conditions.



CHECKING THE TOOTH SPACING OF HELICAL INVOLUTE SPLINE. Finishing teeth on broaches made of Rex High Speed Steels reproduce shapes within tolerances of a few ten-thousandths of an inch.

Crucible tool steel specialists employ new techniques that greatly improve deoxidation of the liquid steel. They also use new ingot mold designs that provide freedom from segregation when the steel solidifies. And they ultrasonically inspect every billet of Rex High Speed Steel before rolling or forging.

Today Rex High Speed Steels continue to make the best broaches because they offer *1.* more uniform distribution of carbides throughout the section. This ensures minimum size change, greater predictability in heat treatment, greater hardenability and more uniform hardness in the heat-treated tool. And *2.* more uniform distribution of sulfides in the free-machining grades—which provides improved machinability and superior surface finish.

To make precision tools better with Crucible's Rex High Speed Steels, call or write the nearest Crucible branch office or warehouse.

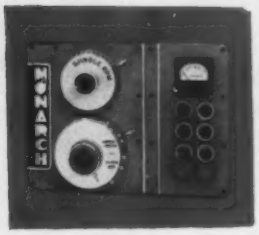
BETTER TOOLS, THROUGH BETTER STEELS. The constant improvement of Rex High Speed Steels ensures the increasingly better performance of hobs, taps, twist drills and cutters—as well as broaches.

CRUCIBLE STEEL COMPANY OF AMERICA

Branch Offices and Warehouses: Atlanta • Baltimore • Boston • Buffalo • Caldwell, N. J. • Charlotte Chicago • Cincinnati • Cleveland • Columbus • Dallas • Dayton • Denver • Detroit • Erie, Pa. • Grand Rapids • Houston • Indianapolis • Los Angeles Miami • Milwaukee • Minneapolis • New Haven • New York • Philadelphia • Pittsburgh • Portland, Ore. • Providence • Rockford • Salt Lake City San Francisco • Seattle • Springfield, Mass. • St. Louis • E. Syracuse • Tampa • Toledo • Tulsa

the Monarch gage for

THE HEADSTOCK THAT THINKS... AND REMEMBERS



1. 36 speeds—range 14 to 1750 R.P.M.—ratio 1 to 125. Standard range low enough, high enough and with plenty of speeds in between to provide reasonably constant surface cutting speed on most work.

2. Optional extra-high speed range of 25 to 2500 R.P.M. available for free cutting metals such as aluminum and for ceramic tooling requirements.

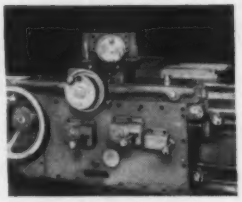
3. Operator works in terms of surface cutting speed. Machine automatically figures correct R.P.M. and sets up shift. Operator sets two large dials—one for work diameter, the other for desired surface speed.

4. Using the two-dial preselector, up to six or more different speed changes may be preset while machine is under cut. This saves speed change time when turning successive diameters having considerable variation or when finish turning immediately follows rough turning. The second dial always indicates spindle speed in engagement.

5. Pull of knob gives free spindle in a jiffy. And there is a generous $2\frac{1}{16}$" hole through the spindle.

6. Hydraulic brake and clutch are self-adjusting for wear. Being under automatic machine control regardless of load, operator need not supply power for engagement.

THE CONTROL CENTER OPERATORS LIKE



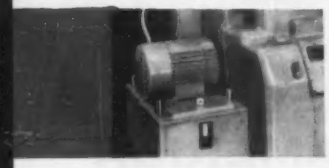
1. Series 62 is controlled by a three-position lever at the apron. A duplicate lever close to the headstock is provided for setup purposes. With it, work rotation may be started or stopped, jogging or speed change may be accomplished. In the SPEED CHANGE position the next speed is engaged automatically when preselection is used.

2. Shifting (an operation performed many times each day) is at finger-touch ease and speed. Hydraulic power does the work of clutching, braking, shifting and jogging.

3. Four-way power rapid traverse is in-built. Both carriage and cross slide traverse may be engaged simultaneously. This saves as much as 50% in tool adjust time.

4. Positive cam controlled feed frictions. Application is such that machine never loses its chip under heavy cuts.

5. Apron or headstock controlled leadscrew reverse, the former a must when much thread chasing is done.



ELECTRICALS WHERE THEY SHOULD BE

1. External main drive motor mounting and external electrical control mounting (either NEMA or JIC) for quick accessibility.

2. Motor mounted on hydraulic system sump from which position it also supplies power for hydraulic pump.

How do your lathes measure up? You get what you pay for in the purchase of a lathe, as with anything else. Greater production, therefore lowered costs, is the major reason for acquiring a new machine. That's what you get in the Monarch Series 62 Dyna-Shift—the only lathe of its general type which can be kept under full load during the entire machining cycle. Major contributing factors design-wise are more machine output per unit of power input, less operator effort, reduced maintenance and ease of supervision. See for yourself why the Series 62 meets all these requirements as does no other lathe on the market.

Users have found that these features and advantages have translated themselves into production increases of 25% or more and tool life improvement up to as much as 50%. And that's the pay-off. When you are ready to invest in a new lathe, buy the best. It's the cheapest in the long run.

THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO

COMPLETE AUTOMATIC LUBRICATION

1. Headstock, end gearing and gear box served by single system of the filtered, combination mist-splash type.

2. Apron lubrication system of the circuited, metered and filtered type also provides oil to carriage guide ways and cross slide bearings.

3. Tailstock has its own lubrication system.

INTERLOCKS FOR SAFETY

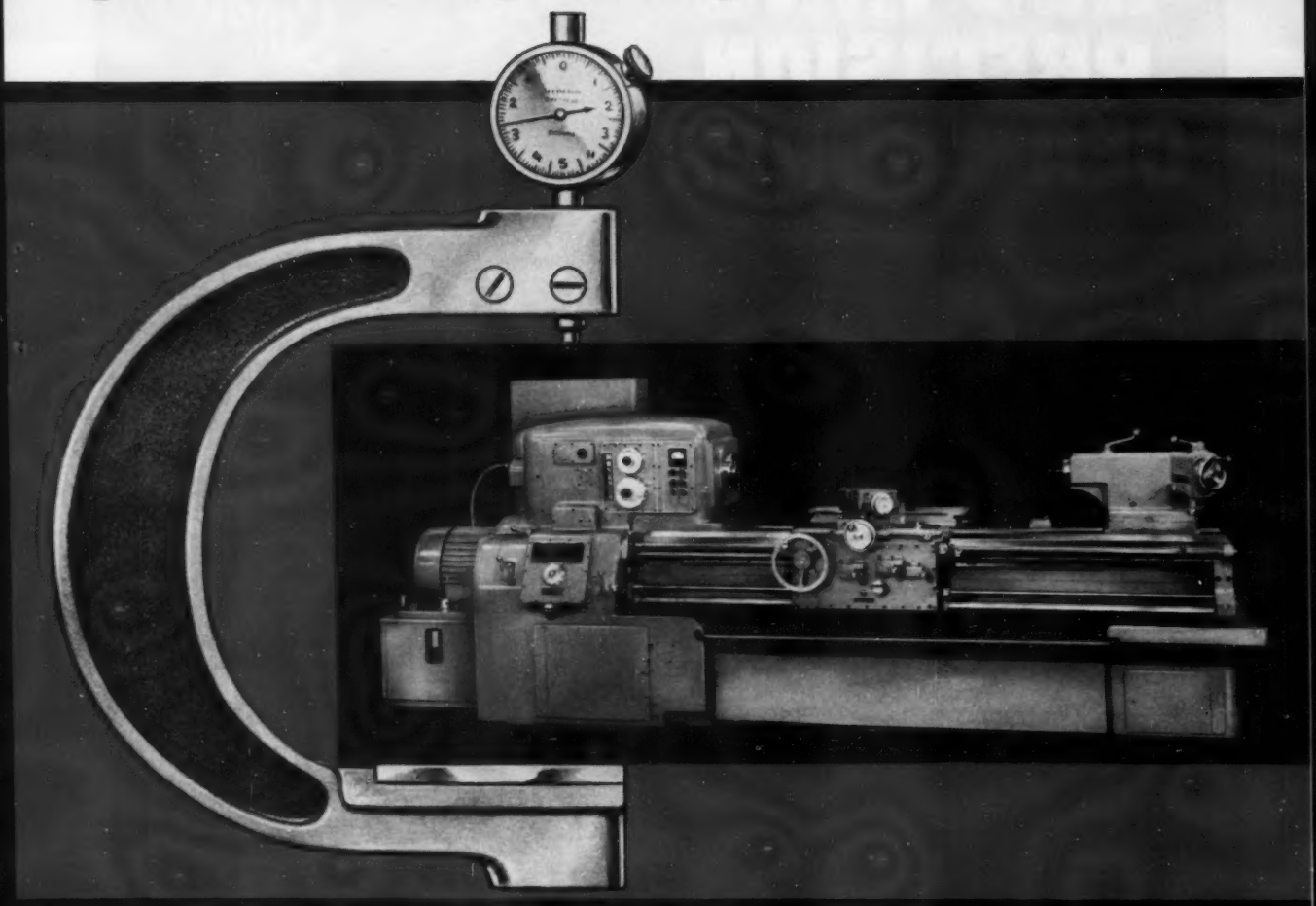
1. When motor is started, the brake engages automatically, preventing spindle rotation regardless of main control lever position.

2. No speed shift can be made with spindle rotating. More than anything else this preserves the original accuracy of headstock gearing.

3. Leadscrew and feed rod cannot be engaged simultaneously; neither can feed and power rapid traverse.

4. Leadscrew reverse cannot be engaged with spindle rotating above 340 R.P.M.

series 62 lathe–
productivity and precision



PROTECTED GEAR BOX AND END GEARING

1. Gear box and end gearing totally enclosed. Lubrication is kept in, dirt kept out, original accuracy maintained.

THE BED...A FIRM FOUNDATION

1. All four bed ways flame hardened and precision ground to keep them factory-fresh for years to come.
2. Generous size chip pans are designed for easy chip removal at front or rear.
3. Longer machines equipped with traveling rod supports which are automatically picked up and dropped off by apron.

TAILSTOCK THAT MEANS BUSINESS

1. Either single speed or two speed range type available with dead or anti-friction center spindle. Sufficient mass and rigidity to support the heaviest of cuts.
2. Movement along bed manually or by power. This combination satisfies all turning conditions.

SUPERVISORY PROBLEMS SIMPLIFIED

1. At a quick glance, supervisor may check (a) work diameter setting, (b) SFPM setting and (c) H.P. consumption. This makes it possible easily and quickly for him to assure full productiveness of machine and operator at all times.

ADDED EQUIPMENT FOR ADDED PRODUCTION

1. Additional equipment in vast variety is available for the Series 62 line. Consider, by all means, the advantages of the "Air-Gage Tracer," a means by which thousands of users have reduced costs substantially.
2. Ask for descriptive booklet No. 1506 which not only describes the basic machine but the commonly used items of additional equipment. It includes full specifications.

Monarch
TURNING MACHINES

NEW!
RED RING PRECISION GEAR HONER

Smaller

More Compact

Lower Cost

FULLY AUTOMATIC
SEMI-AUTOMATIC
MANUAL LOADING

Your choice of 4 Honing Methods

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING,
GEAR HONING AND ELLIPTOID

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

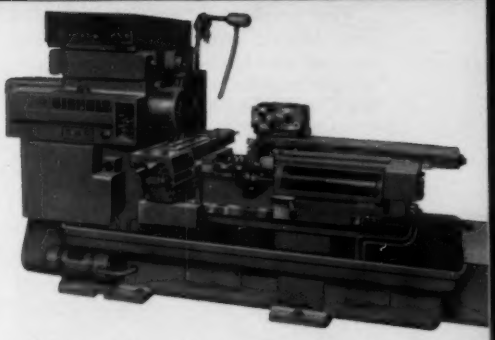
PRODUCTION POINTERS

from **GISHOLT**

MASTERLINE GISHOLT SINCE 1887

NEW GISHOLT AR LATHE SAVES GRAY COMPANY 50% ON BAR AND CHUCKING JOBS

New No. 5AR (Automatic Ram) speeds machining, improves quality, lengthens tool life on job lots and production runs



"Why buy two when one will do?" That was the basic reasoning used by Gray Company, Inc., Minneapolis, Minnesota, in selecting an automatic to replace hand-operated machines for bar and chucking work. This firm found the ideal answer in the new Gisholt AR—*the first truly automatic ram type turret lathe.*

The new No. 5AR turns out parts 50% faster, on the average, than manually operated turret lathes. Operator fatigue is eliminated with the automatic cycle. Tool life is longer; work quality and production rates are consistent; tolerances are easily held.

Gray Company manufactures the well-known "GRACO" line of air-powered pumps for transfer and application of materials, and automotive servicing equipment. Here is how a typical job, a cast iron reel hub, is handled on the new 5AR. The work is machined in two operations. Only the second operation is illustrated. The operator chucks on the O.D., locating against the previously machined face. Multiple tooling on the hex turret drills, shave-faces, turns the O.D. and the pilot diameter. Tooling on the second station finish-bores. The cycle stops at station 3, which is blank, providing ample space for loading and unloading. Front and rear cross-slide tools operate at separate times with the two turret stations to step-face the work. The turret is double-tooled to finish two pieces with each complete index. Finish ranges from 100 to 125 micro-inches RMS. A tolerance of +.000", —.001" is held in the bore.

Compare these production rates

Operation 1

Manual turret lathe	14 pcs./hr.
New AR turret lathe	26 pcs./hr.

Operation 2

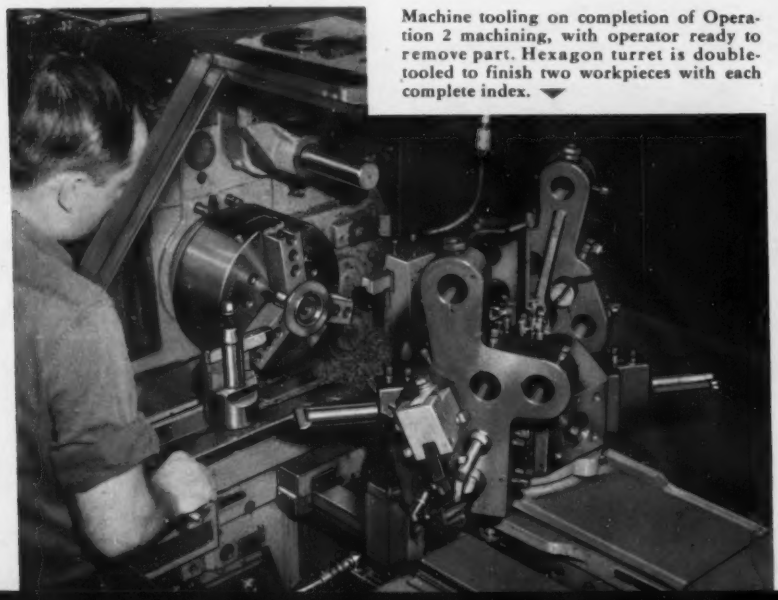
Manual turret lathe	34 pcs./hr.
New AR turret lathe	55 pcs./hr.

The new Gisholt AR Turret Lathe combines automatic cycle efficiency with the versatility and quick setup of the hand-operated ram type turret lathe. The automatic cycle frees the operator to handle another machine or do other work, in most cases greatly increasing productivity.

The Gisholt AR converts from chucking to bar work in approximately one hour. Aside from cycle programming, there are no new machine setup procedures to learn and no gears to change. It uses standard tools, available in most shops.

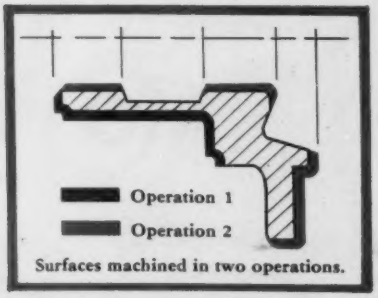
It sets up fast. Machine functions, electrically or hydraulically controlled, are preselected for each turret station. This includes spindle speeds, indexing, traverse and feed of the turret, and independent operation of the cross slide. An experienced operator learns to set up his own cycles in approximately one day.

To get the complete story on the versatility and economy of the AR—the new automatic ram costing little more than hand-operated machines—contact Gisholt.



Machine tooling on completion of Operation 2 machining, with operator ready to remove part. Hexagon turret is double-tooled to finish two workpieces with each complete index.

Left—rough workpiece; center—after first operation; right—after Operation 2.



Surfaces machined in two operations.

For complete information on new Gisholt AR, circle No. 708 on Reader Service Card.

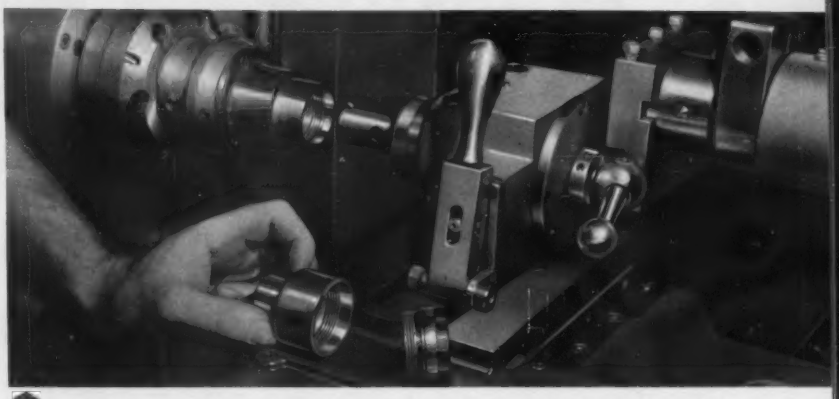
CRI-DAN THREADS COMPLEX PARTS 100% FASTER FOR BELL AND HOWELL

Two-start Class 4 threads and 32 micro-inch RMS finish produced by simple tooling setup

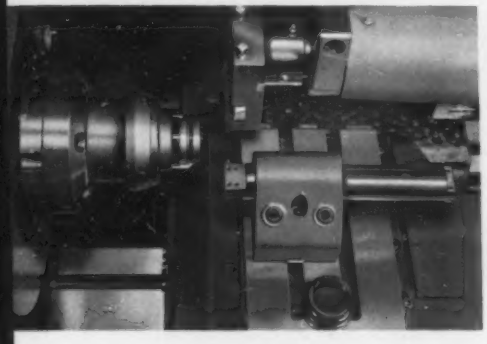
Looking for ways to reduce costs and improve quality on threading jobs? These CRI-DAN B setups for multiple-start threading to close tolerances may provide new answers. They cut threading time in half on two complex parts for Bell and Howell, Chicago.

The workpiece: a front cell lens with mating zoom operation sleeve for Bell and Howell 8 mm. Zoomatic movie cameras. Both require a 2-start, .0625-pitch, .125″-lead, Class 4 thread. In addition to a 32 micro-inch RMS finish, the lens diameter and the sleeve bore are held within ±.001″ to assure smooth operation.

The illustrations and captions show how simple, low-cost attachments are used with the fast CRI-DAN automatic threading cycle to combine operations for greater accuracy and increased production efficiency.



Zoom operating sleeve. Material, aluminum—with machined relief at back of bore. I.D. pilot diameter is finish-bored. Boring bar is indexed to the threading tool. A 2-start, .0625-pitch, .125″-lead, Class 4 16 NS thread in the 1.610″ center section is produced in 12 automatic passes at 675 s.f.m. Threading time, 20 seconds.



Front cell lens. Material, aluminum. O.D. pilot diameter is turned. Single tool on front threading slide produces 2-start, .0625-pitch, .125″-lead, Class 4 16 NS thread on the 1.610″ leading diameter in 12 automatic passes at 675 s.f.m. Threading time, 20 seconds.

Using inexpensive carbide tools, the CRI-DAN method is many times faster than thread grinding or thread milling...handles toughest jobs on hardest materials for less.

For complete information on CRI-DAN, circle No. 709 on Reader Service Card

HERE'S ONE WAY TO REDUCE HANDLING AND SPEED CHUCKING OF HEAVY PARTS

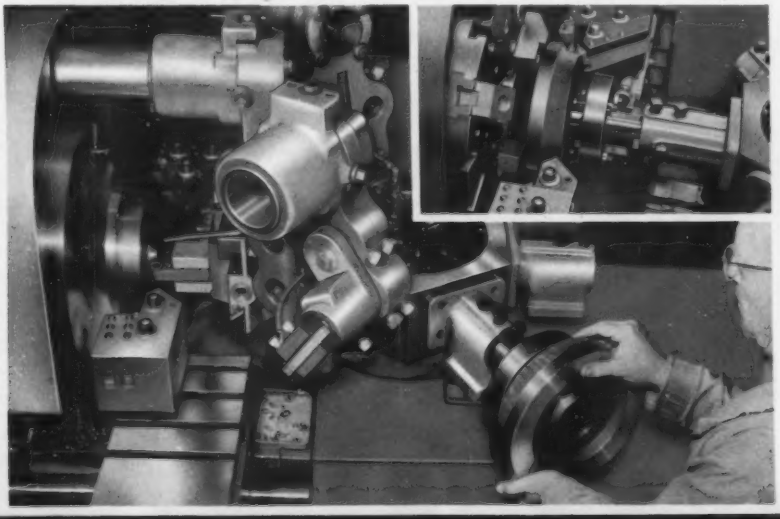
Turret-mounted loading arbor operates during automatic cycle on 2F Fastermatic

Whenever you're handling heavy or unwieldy work, a little extra attention to loading equipment can pay important dividends. For example, this job: The workpiece, a steel bomb base plug forging, is machined in two operations on two Gisholt MASTER-LINE 2F Fastermatic Automatic Chucking Turret Lathes. One operator handles both machines. The second operation setup is shown. It illustrates how most of the work-handling is done *during* the automatic cycle.

Hex turret tools turn the O.D. and chamfer. Operating separately, rear cross-slide tools rough-face the flange and plug base, and front cross-slide tools finish-face the flange, relieve the flange base, and chamfer. A turret-facing attachment on the rear cross slide actuates a turret-mounted slide tool, finish-facing the plug base.

While the slide tool finish-faces, the operator places a new part on the turret-mounted loading arbor. The cycle ends with the rough part facing the spindle. The operator removes the finished piece and starts the new cycle. The hex turret brings the work to the chuck. Spring-loaded jacks force it against the chuck while it is gripped on the O.D. The hex turret reverse-traverses as the spindle rotates and indexes to the first machining station. Time, 7.2 min. f.t.f.

Tooling for second operation on bomb base plug. Turret-facing attachment on rear cross slide actuates turret-mounted slide tool, finish-facing the plug base. At the same time, the operator places a new part on the turret-mounted loading arbor. (Inset) Arbor about to locate work before chucking.



Loading arbor on hex turret operates as part of Fastermatic's automatic cycle—improving chucking accuracy, reducing handling time, increasing production.

For complete information on Fastermatic, circle No. 710 on Reader Service Card.

SUPERFINISHING SAVES TIME, ELIMINATES GRINDING ON PUMP SEAL FACE

Fixture on specially tooled Model 51 Superfinisher handles different part sizes

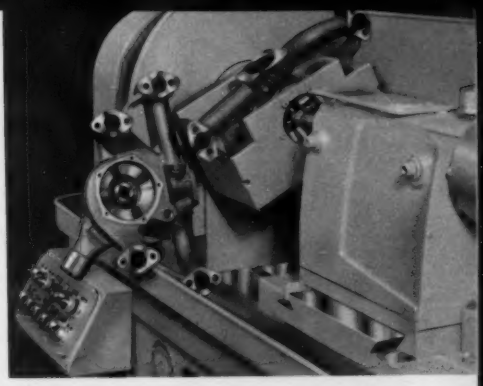
Here is a setup that cut finishing time 50% and eliminated grinding on the pump seal faces of cast iron water pump bodies for a well-known automotive manufacturer. This is a special job, demonstrating the versatility offered by the standard Gisholt Model 51 Superfinisher.

The machine consists of a standard bed with a special box-type fixture mounted on the spindle for centralizing, locating, holding and driving. The fixture is designed to handle more than nine different part styles. A self-driven rotary quill, carrying a cup stone, is also mounted on the bed. An air cylinder moves the quill into working position and retracts at cycle end for loading clearance. Guarding, not shown, encloses the headstock fixture and the rotary quill. It is mounted on tracks and moves easily for loading and unloading.

Here is the Superfinishing cycle: Work is placed in the fixture. The spindle and the cup stone rotate in opposite directions, reducing the pump seal face from a precision-machined surface of 100-125 micro-inches RMS to 8 micro-inches RMS. Superfinish stone contact time, only 12 seconds. Production rate, 60 parts per hour at 80% efficiency.

Specially tooled Model 51 Superfinisher handles unwieldy part in minimum time. Superfinishing eliminates intermediate grinding...provides "controlled" surface, free of smear metal, for longer service life.

For complete information on Gisholt Superfinishing, circle No. 711 on Reader Service Card.



Automotive water pump housing, held in special fixture on Model 51 Superfinisher. Seal face reduced from precision-machined surface of 100-125 micro-inches RMS to 8 micro-inches RMS in only 12 seconds stone contact time.

M & H VALVE & FITTINGS CO. COMBINES OPERATIONS, SAVES 40%

Two Gisholt lathes replace three machines, improve accuracy, simplify machining of fixture work

Right now in your shop you may have jobs where special tooling on a standard lathe can reduce complex work to simple routine operations. That was the case at M & H Valve & Fittings Company, Anniston, Alabama.

M & H came to Gisholt for recommendations for improving accuracy and production on tapered wedges and straight-faced flat discs. Three machines were in use. Wedges and discs were faced and grooved on one machine, a bronze ring was rolled-in on the second and faced on the third.

Gisholt suggested two new machines: a 1L and a 2L Saddle Type Turret Lathe which could be set up to complete a wedge or disc side in a single chucking.

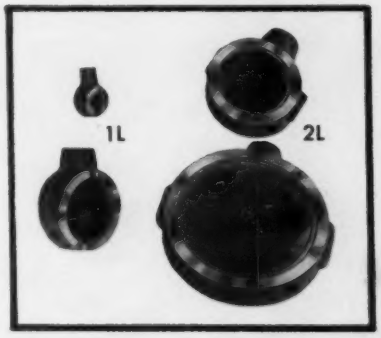
Two important machine features make such a setup possible: 1, machine flexibility combines special machine functions and tooling, and standard machining; 2, a cross-feeding hex turret eliminates need for cross-slide carriage, increasing the swing capacity of each machine.

A chucking fixture assures accurate parallel or angular relationships. Adjustable jacks hold straight work; tapered wedges are held in a special angular locating plate. The wedge is faced and grooved with special cross-feeding tool blocks. The brass ring is rolled-in with rollers mounted on a tool block. Force is applied by a special bed-mounted pusher bar. After rolling-in, the seat ring is finish-machined. One side of a typical 6" tapered wedge is completed in just 9 min., f.t.f.

Change-over is fast, since tooling adjusts to accommodate all work sizes.

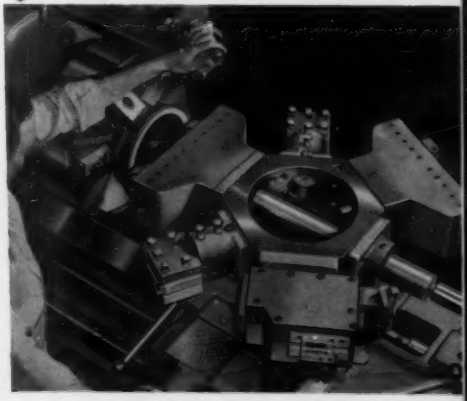
Two Gisholts replace three other lathes... eliminate two work handlings...improving accuracy. Time reduction averages 40%. Special tooling does not prevent use of machine for standard work.

For information on Saddle Type Turret Lathes, circle No. 712 on Reader Service Card



Workpiece range handled on two saddle type turret lathes. Seven sizes of tapered wedges and straight discs, from 2" to 6", are machined on the 1L. Four more sizes of each type, from 6" to 12", are machined on the 2L.

Overhead view of rolling-in operation on 12" tapered wedge. Note thrust bar and tool block with rollers which seat brass ring. All tool holders adjust to part sizes.



GISHOLT

ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT MACHINES WITH NEW MACHINE GUARANTEE

SMART SETUP SOLVES PROBLEM . . . CUTS TURNING TIME FOR WESTINGHOUSE

Simple tooling eliminates distortion on stator core assemblies...No. 12 Automatic speeds machining

Largest and smallest of five stack lengths of electric motor stator core assemblies. Cup-shaped tailstock prevents distortion. Simple spacer rings and mandrel bushings speed change-over to different sizes. No. 12 reduces turning time 25%.

You may never encounter a problem similar to this one faced by Westinghouse Electric Corporation, but you'll be interested in the solution. It points out that even the simplest job, on the *right* machine, can present problems that are solved only through experience—the kind of tooling know-how that Gisholt offers on all jobs, large or small.

The operation: Turning the O.D. on electric motor frame stator core assemblies. The machine: A Gisholt No. 12 Automatic Chucking Lathe.

Each core assembly consists of a number of free-cutting electric steel stampings, stacked and laminated. Five different stack lengths in each of two bore sizes are machined at high production rates.

Tooling appears simple. Work is held on an air-operated mandrel—is located against a spacer ring at the headstock end. Spacer rings compensate for different lengths, mandrel bushings for different diameters—keeping change-over at a minimum. A front carriage tool turns the O.D.

Here's the problem: It was found that the laminations at each end tended to "crimp" from tool pressure. Also, gripping in the I.D. caused the laminations at each end to "dish out."

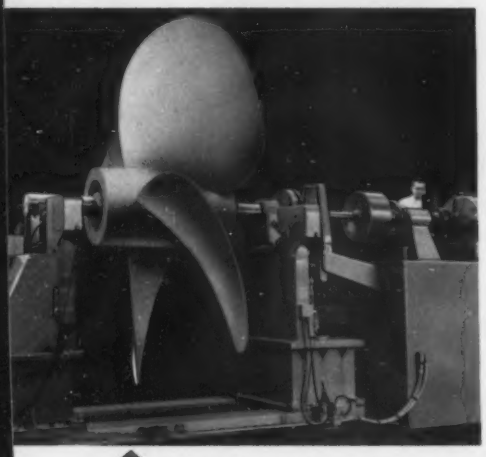
The solution: Maximum-diameter spacer rings eliminate distortion by providing support at the headstock end. A cup-shaped tailstock centering arrangement supports the mandrel and applies pressure evenly around the outer edge of the work.

Smart tooling eliminates work distortion... cuts change-over time on high-production parts. Fast, automatic cycle on No. 12 cuts time 25%.

For complete information on Gisholt No. 12 circle No. 713 on Reader Service Card.

BALANCES SHIP PROPELLER IN 83% LESS TIME

Gisholt Balancer saves 20 hours per propeller for Long Beach Naval Shipyard ... eliminates guesswork



This 12′, 15,650-pound destroyer propeller requires a single-plane, static unbalance correction—the method used when the diameter of workpiece is considerably greater than width. Machine is easily set up to measure and locate static unbalance, and check force or moment unbalance—keeping work well within tolerances required to eliminate excessive bearing wear and possible engine damage. Support pedestals adjust to accommodate work. F.t.f. times are reduced from 24 to only four hours average. Extreme accuracy offered by Gisholt Balancing reduces metal removal required to balance—extending propeller service life.

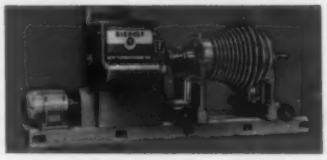
You may not have balancing jobs as large as this 12′-diameter ship propeller, but the balancing principles used here could give you greater speed and greater accuracy in your type of work.

Balancing time on former equipment averaged 24 hours for just one of these 15,650-pounders. In some cases, the job required two men working up to three 8-hour shifts. Considerable guesswork was required to meet the specified tolerances. This meant excessive trial-and-error grinding, with metal removal equaling five years of normal wear on some jobs. And the job was dangerous. Unbalance readings could be taken only at high speeds. There was always the chance that unbalance vibration would throw the huge propeller off the machine.

Now a Gisholt Type U Balancer, with electrical networks providing fast setup and accurate readings, has reduced average time to only four hours, f.t.f. This includes loading by crane, measuring and locating unbalance—correction by grinding, and inspection. Guesswork has been eliminated. Complete safety is assured: The work is held securely in half-bearings and rotational speeds have been reduced to a relatively slow 150 r.p.m.

Gisholt Balancer reduces big propeller job to routine operation with fast setup, accurate amount and angle readings... cuts average f.t.f. time 83%... reduces correction grinding... extends service life.

For complete information on Gisholt Balancers, circle No. 714 on Reader Service Card.



No. 3-460
756

The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Printed in U.S.A.

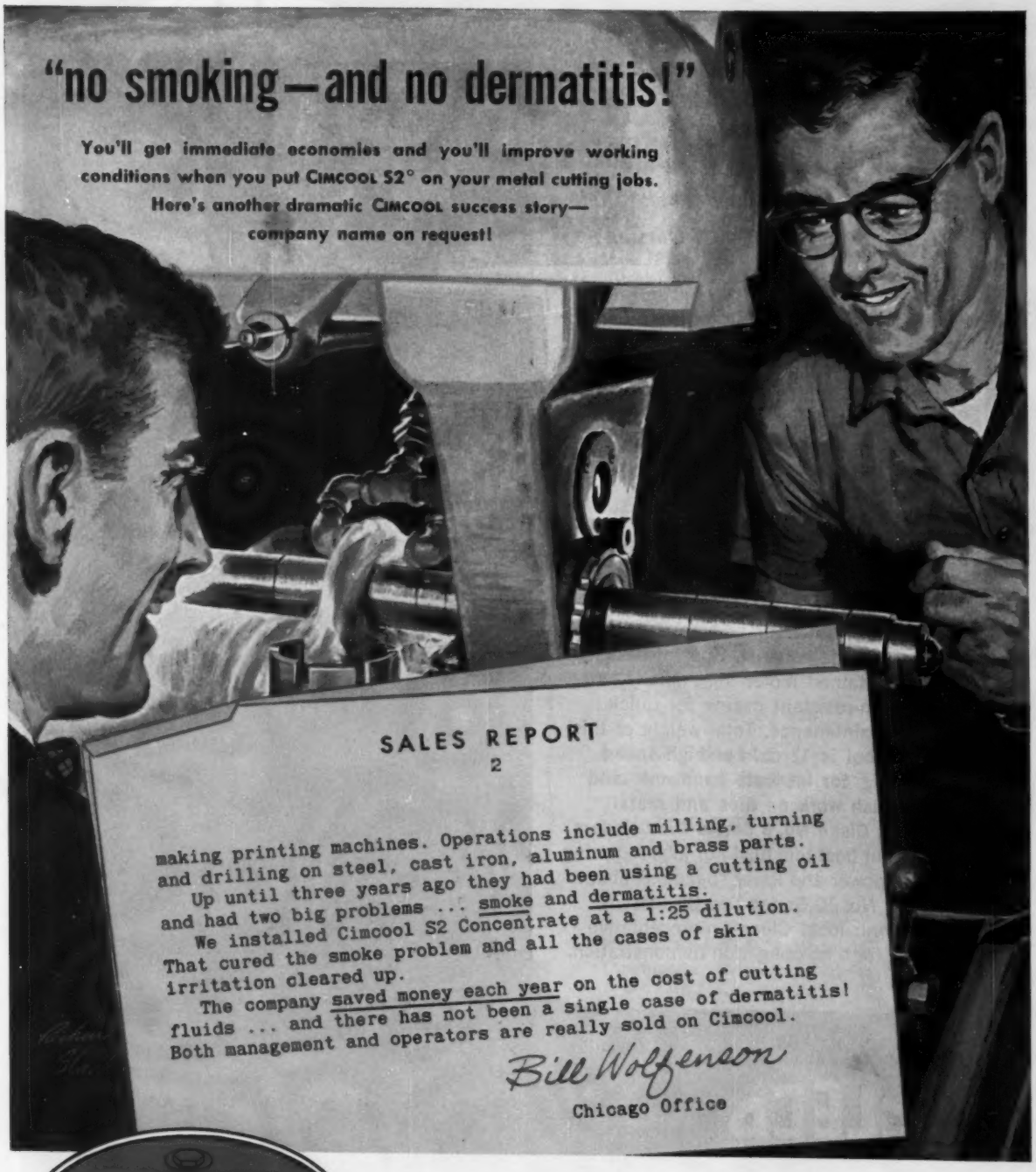
GISHOLT

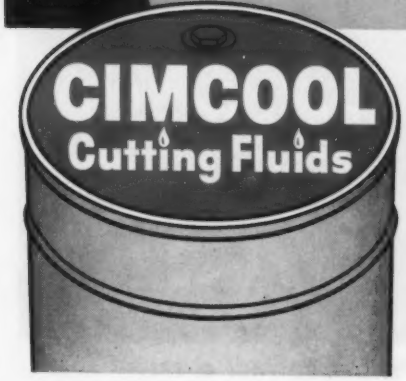
MACHINE COMPANY Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • Packaging Machines • Masterglas Molded Plastic Products

"no smoking—and no dermatitis!"

You'll get immediate economies and you'll improve working conditions when you put CIMCOOL S2° on your metal cutting jobs. Here's another dramatic CIMCOOL success story—company name on request!


SALES REPORT
2
making printing machines. Operations include milling, turning and drilling on steel, cast iron, aluminum and brass parts.
Up until three years ago they had been using a cutting oil and had two big problems ... smoke and dermatitis.
We installed Cimcool S2 Concentrate at a 1:25 dilution. That cured the smoke problem and all the cases of skin irritation cleared up.
The company saved money each year on the cost of cutting fluids ... and there has not been a single case of dermatitis! Both management and operators are really sold on Cimcool.
Bill Wolfenson
Chicago Office



FOR 100% OF ALL METAL CUTTING JOBS

Production-proved products of The Cincinnati Milling Machine Co.

CIMCOOL S2 Concentrate — The pink fluid which covers 85% of all metal cutting jobs.
CIMPERIAL° — Newest in the famous, industry-proven line of CIMCOOL° Cutting Fluids.
CIMPLUS — The transparent grinding fluid which provides exceptional rust control.
CIMCUT Concentrates (AA, NC, SS) — For every job requiring an oil-base cutting fluid.
ALSO — CIMCOOL Tapping Compound — CIMCOOL Bactericide — CIMCOOL Machine Cleaner.

For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

°Trade Marks Reg. U. S. Pat. Off.

CLECO PRECISION DIE GRINDERS

Powerful, High Speed Tools That Usher In A New Era Of Outstanding Performance

In their class, Cleco's new No. 6 Series Die Grinders have no peer. They are designed for high speed, precision work requiring carbide burs or small mounted points. Only 4⅞ inches long, these grinders will produce more power under load than any other tool of their type. Free speed is 30,000 rpm. Precision spindles and chuck reduce "run-out" and vibration even at this high speed.

Cleco Precision Die Grinders are available with lever or button throttles, front or side exhaust. Special design, self-contained motor slips into abrasion-resistant casing for quick, easy maintenance. Total weight of this quiet tool is 12 oz. **For high speed grinding, for intricate handwork, and for finish work on dies and metal molds, Cleco No. 6 Series Die Grinders are your best tool buy!** For jobs requiring more power and lower speed ask about Cleco No. 10 Series Die Grinders. Call your local Cleco® representative today for a no-obligation demonstration.

MORE POWER, HIGHER SPEED!

CLECO

AIR TOOLS

A Division of REED ROLLER BIT COMPANY

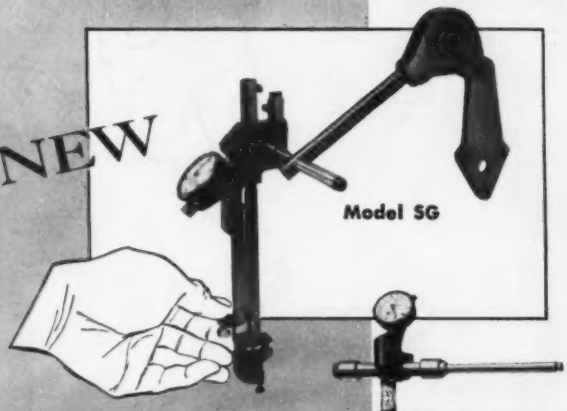
P. O. BOX 2119 • HOUSTON 1, TEXAS

IN CANADA:
Cleco Pneumatic Tool Company of Canada, Ltd.
927 Millwood Road,
Leaside (Toronto), Ontario

SEE THIS CLECO TOOL MAKE ITS PUBLIC DEBUT AT THE ASTE SHOW: BOOTH NO. 526.

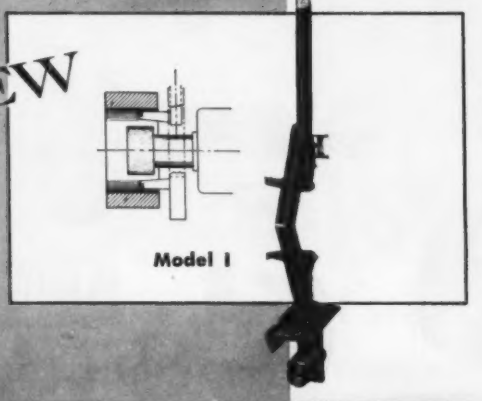
3 NEW ARNOLD GRINDING GAGES Distributed by FEDERAL

NEW



Model SG

NEW



Model I

NEW

Model LG

Here are three new Arnold Grinding Gages. The Miniature (SG) and King Size (LG) Models now permit continuous measurement for O.D.'s from .060" all the way up to more than 30". And, for the first time, there is an Arnold Grinding Gage to continuously measure I.D.'s. These, like all Arnold Gages, eliminate having to "grind and check". Size of part is shown continuously as metal is being removed, so operator always has positive and precise size control without having to stop his machine until the piece is finished. No oversize regrinds . . . no undersize rejects.

FOR SMALL O.D.'s Model SG

- Calipers adjustable from .500" to .093"
- Special calipers as small as .060"
- Easily adapted to automatic size control of small parts
- New style supporting hub

FOR I.D.'s Model I

- Checks internal diameters continuously *while* grinding
- Contacts adjustable over 1½"
- No interference with grinding wheel
- Turret-mounted indicator rotates to any position
- Easy to position and retract

FOR LARGE O.D.'s Model LG

- Continuously measures diameters up to 30" and larger
- Single dimension or wide range adjustable calipers
- New ball bearing mounting
- Rigid, heavy duty frame

VISIT OUR BOOTH * '60 ARNOLD TOOL INC.

BOOTH 1000

ASK FOR CATALOG

FEDERAL PRODUCTS CORPORATION
6114 EDDY STREET,
PROVIDENCE 1, RHODE ISLAND

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting, or Automation Gaging

For more data circle this page number on card at back of book

UNIVERSAL JIG AND FIXTURE COMPONENTS AND CLAMP ASSEMBLIES

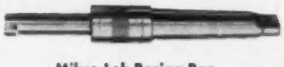
Shown here are a few of more than a thousand different items in regular steel and stainless steel —the largest and most complete selection in the United States—now available from Universal Engineering Co. Write today for your copy of the complete, new catalog.

213

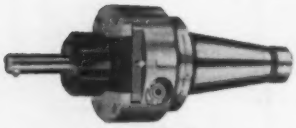
OTHER PRECISION-BUILT COST SAVING UNIVERSAL PRODUCTION TOOLS

Floating Chuck

Standard Collet Chuck



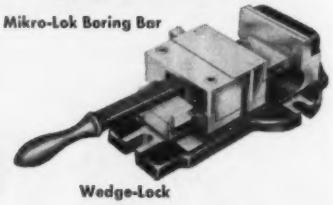
Mikro-Lok Boring Bar



Boring Chuck

"Kwik-Switch" Tool Holder

Standard Drill Bushing



Wedge-Lock Production Vise

UNIVERSAL ENGINEERING COMPANY, FRANKENMUTH 2, MICHIGAN

Tool Steel Topics

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Inserts of Brake Die Tool Steel form runners for oven wrappers

The sheet-steel part above is an oven "wrapper" for a gas range, produced by Calorie Appliance Corp., Topton, Pa. The wrapper has deep side-member runners on opposite sides. These were formed by inserts of Bethlehem Brake Die in the tool steel forming die at the right of the photograph.

Calorie's engineers reported fine results with Brake Die because of its durability. It also proved economical, as it saved time during machining. Used in duplicate sets of three, the inserts formed 22-gage steel to the tune of some 4,000 pieces before polishing became necessary.

Bethlehem Brake Die is ideal for intricate bending and forming applications because of its fine wear resistance, high toughness, and exceptional resistance to impact. It saves money, because it comes in the heat-treated condition, ready for machining without further hardening. We not only quench and temper Brake Die to develop its superior properties—we also straighten it mechanically. This is followed by a stress-relief-anneal, then gag straightening.

Give Brake Die a trial. But don't baby it—choose a tough job. The nearest Bethlehem tool steel distributor will be pleased to work with you.

Because of its high vanadium content, Bethlehem Cromo-High V is ideal for die casting aluminum- and magnesium-base alloys in the 1200F-1300F range.

Cromo-High V has outstanding machinability because it comes in the annealed condition (Brinell 207). It has excellent resistance to the formation of a fine network pattern of heat checking. In heat-treatment, it develops the uniform hardness needed to resist wash and erosion.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Bake Tools After Plating

There are three reasons why tools are electroplated with chromium or nickel: (1) salvage, by regaining worn dimensions, or correcting mechanical errors (2) decoration (3) to resist wear or metal pickup.

Although electroplating of hardened tools is relatively simple, it can be hazardous if the plating is not followed by baking (tempering). During deposition of the plated metal, a considerable amount of hydrogen also is deposited on the tool. Some of this hydrogen diffuses into the tool. This causes extreme brittleness, so that if the tool is used immediately after plating, breakage in service may occur.

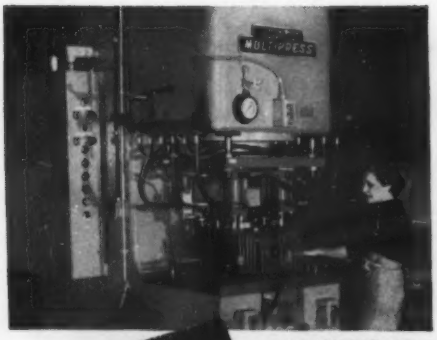
To avoid such an occurrence, bake the tool at 300-400F for at least four hours, to restore its original ductility. Baking should begin as soon as possible after plating. Grinding should never be done on the steel itself prior to baking. If baking is omitted, the tool will gradually recover its ductility at room temperature in from two to three weeks. It will be subject to breakage if used before the recovery has been completed.

Denison, Denison HydrOILics, and Multipress are registered trademarks of Denison Eng. Div., ABSCO

DENISON HydrOILics

How MOTOROLA punches TV chassis faster and cuts scrap loss. Typical of how a Multipress Analysis Program can help you **MAP** superior production methods.

NO SCRAP



450 HOLES AT A TIME ...*a 100-ton Denison hydraulic Multipress precision-punches radio-TV chassis at Motorola, Inc., Chicago. Plastic chassis bases are shown at left, before and after punching.*

NO SCRAP problems on this pressing job. And Motorola radio-TV plated-circuit plastic chassis bases produced at this Chicago plant are precision-punched faster ... more accurately ... at less cost with Denison hydraulic Multipress.

Here's why: With one quick ram stroke, a 100-ton Multipress punches up to 450 holes at a time in each base. Multipress does the job with *no shock* ... with absolute control after break-through. Holes are clean and smooth ... affording the necessary, uniform plating surface inside each hole. There's *no bulging ... no cracking* around or between holes because Multipress delivers controlled hydraulic pressure.

Plus benefits with Multipress—longer die life ... almost no punch breakage ... handles 15 different dies for quick changeover to other full-production jobs ... *and there's almost no scrap loss.*

Endless jobs throughout the electronic and other industries can be done better ... for less with Denison hydraulic Multipress—capacities from 1 to 100 tons. Ask your Denison Production Specialist to show you how with a **M**ultipress **A**nalysis **P**rogram made in your plant now—at no cost. It's the first step to **MAP** new savings in your production operations.

DENISON ENGINEERING DIVISION
ABSCO
1152 Dublin Road • Columbus 16, Ohio

HYDRAULIC PRESSES
PUMPS • MOTORS • CONTROLS

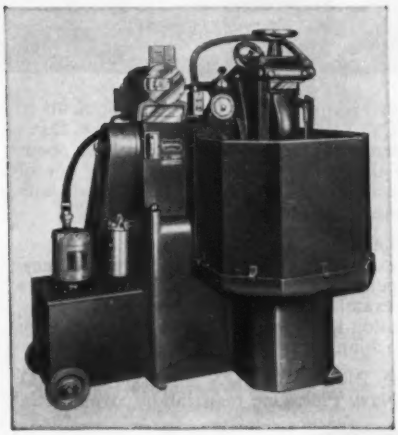
DENISON
HYDRAULIC MULTIPRESS

OLIVER Template Tool Bit Grinder

Duplicates Precisely in One Operation

That's right! The Oliver Template Tool Bit Grinder sharpens single point tungsten carbide, high speed and stellite turning tools . . . duplicating exactly all original flats and radii every time the tool is ground . . . in one simple, efficient grinding operation.

How is it done? Well, as you can see from the drawing above the answer lies in "template control." The template at the top of the specially designed tool holder is a twice size replica of the tool form being ground. The tool, securely held at mid-point in the holder, contacts the wheel and is ground until the template touches the template stop. In this manner, the tool is ground to the *exact* profile of the template. The entire operation is performed in seconds — easily, accurately on one machine . . . a machine that pays for itself by reducing your tool inventory and by eliminating lost production time and tool breakage.



Want proof? Oliver will grind your tools on a "no charge" basis. Write today for full information. We'd like the opportunity of sending you a quotation.

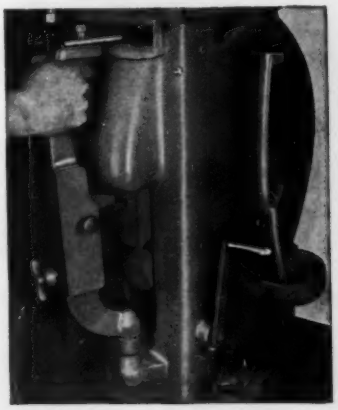
OLIVER of ADRIAN

1410 E. Maumee St. • Adrian, Michigan

DRILL GRINDERS AND THINNERS · TOOL AND CUTTER GRINDERS · AUTOMATIC AND MANUAL FACE MILL GRINDERS – TOOL BIT GRINDERS – CONTOUR SAWING AND FILING MACHINES

How to add dividends to single point tools

The tool room can add four "dividend areas" through use of the Oliver 20" Template Tool Bit Grinder and can protect initial investment in tool bits. The dividends available to you are (a) rapid sharpening, (b) positive duplication, (c) grinding wheel economy and, (d) high salvage value.



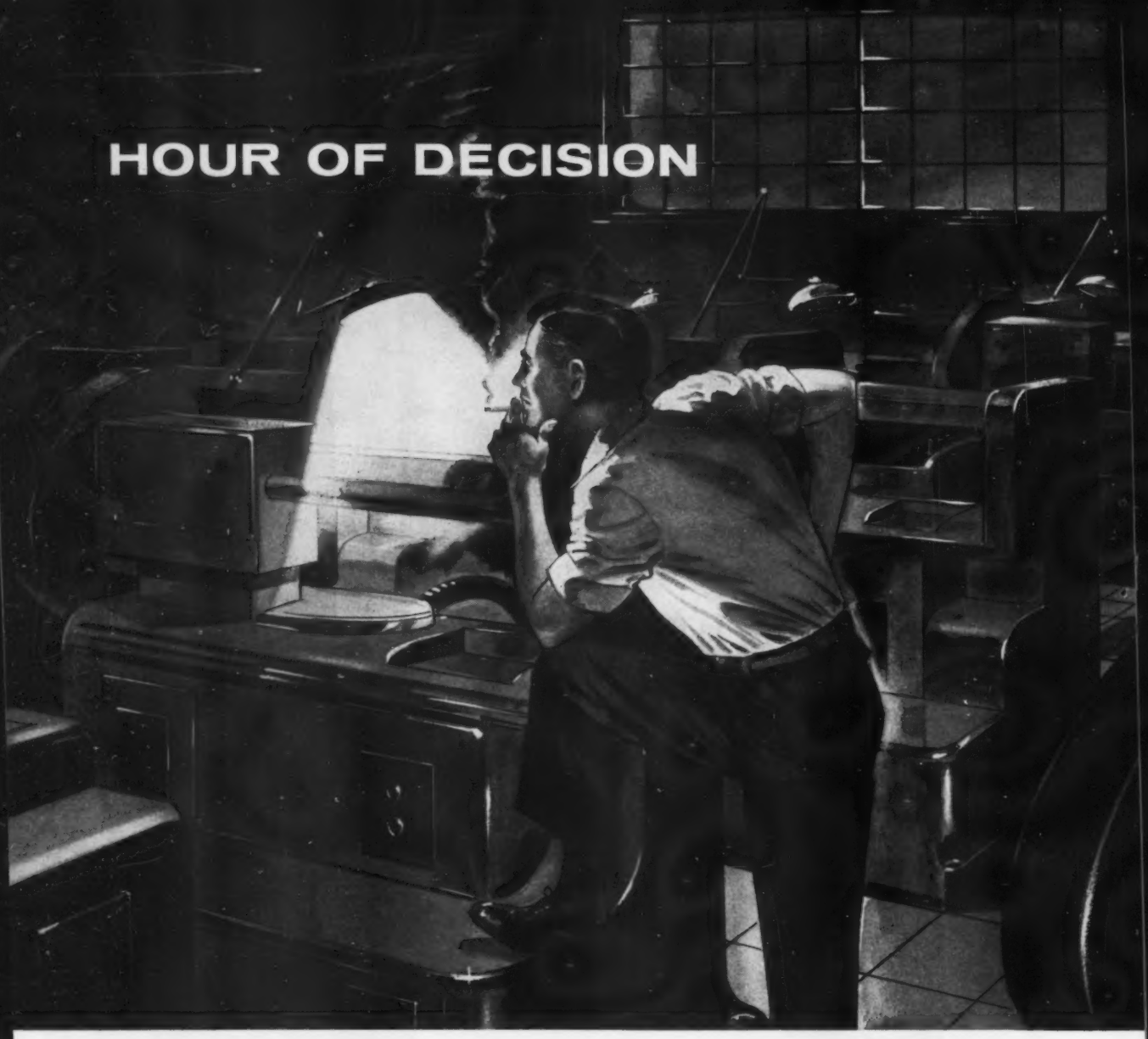
The total time involved in sharpening a tungsten carbide tipped tool bit is negligible. An average ¾" square tool calling for a total stock removal of about 1/32" is sharpened completely in approximately 30 seconds. This includes all angles, radii and soft steel support.

Positive duplication is readily assured. Once your tool engineer has determined the proper shape and clearance for best results, it is important that there be no guess work on subsequent grinds. The Oliver template control insures such a grind.

Grinding wheel economy is extraordinary. Practically all users have found secondary diamond wheel finishing of carbide tipped tools completely unnecessary. The 20" diameter silicon carbide wheel produces a micro-finish almost equal to that ground with a diamond wheel.

Your tool bits *can* have a high salvage value. It is common practice to discard tool bits when the carbide contains an area which has broken out for a considerable distance. The removal of the damaged area is quite expensive by ordinary grinding methods. The Oliver Tool Bit Grinder permits the removal of 1/8" or ¼" of carbide in a minute or two, thus giving you new tool performance once again at a very low cost.

HOUR OF DECISION



IS THIS YOU? How many times, after the call bell stops clanging, the customers stop phoning, and people stop asking questions, do you walk into the quiet shop to face up to the really vital decisions?

"How can we compensate for the rising costs of materials, overhead, payroll, maintenance?" "How can we keep producing the exacting tolerances, finishes, and quality our markets are demanding?" "How can we improve our production efficiency so that our narrow profit margin will not disappear altogether?" "How can we meet and beat the increasing world-wide competition in our field?"

One proved answer to these questions is the logical replacement of obsolete, inefficient machines. THE MACHINE TOOL EXPOSITION — 1960 will back up this fact with 11 acres of the latest developments in machine tools. Can you afford to miss seeing new, faster machine tools that will produce more efficiently . . . new, better methods that will cut satisfying chunks out of metalworking costs . . . new, ingenious ideas that will help you produce more quality for less cost?

Tool-up for the Sixties. Plan *now* to attend the largest, single-industry exposition ever held in the United States. Have your key personnel on hand, too. It's a once in five years chance to examine the latest technological advancements in automation through numerical controls and see why Modern Machine Tools = Production Efficiency!

Also see the PRODUCTION ENGINEERING SHOW on the Navy Pier. One registration covers both.

FORMULA FOR TOMORROW

MODERN MACHINE TOOLS MMT=PE PRODUCTION EFFICIENCY

International Amphitheatre
Chicago, Illinois
Sept. 6-16

THE MACHINE TOOL EXPOSITION – 1960

For information write to

NATIONAL MACHINE TOOL BUILDERS ASSOCIATION

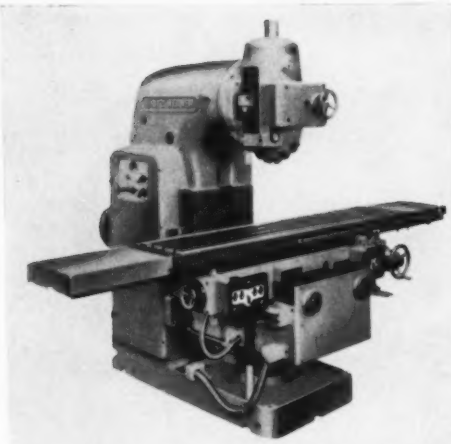
2139 Wisconsin Avenue, N.W. • Washington, D. C.

WERNER

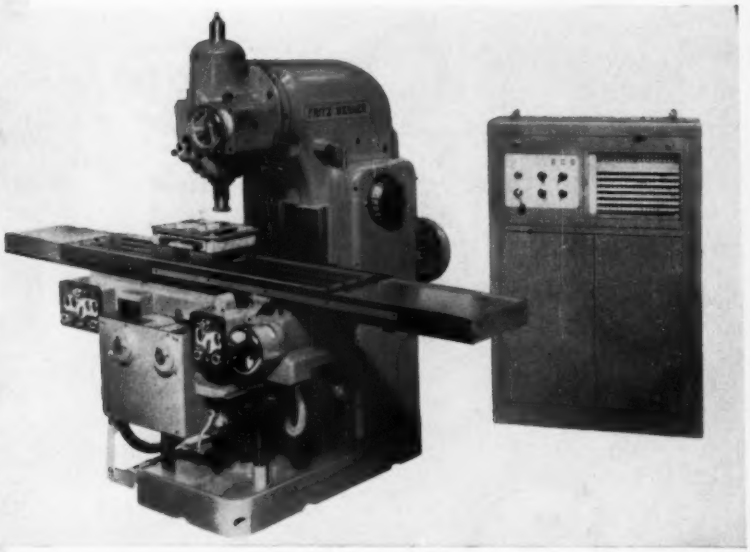
VERTICAL • UNIVERSAL
PLAIN AND PRODUCTION **MILLERS**

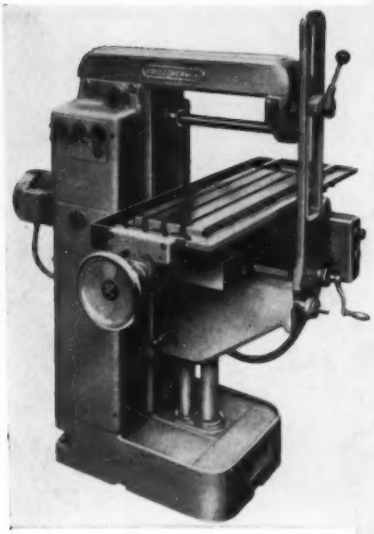
SEE US AT BOOTH 1919

A. S. T. E. SHOW, DETROIT. APRIL 21 – 28, 1960



Vertical Millers, 1-6



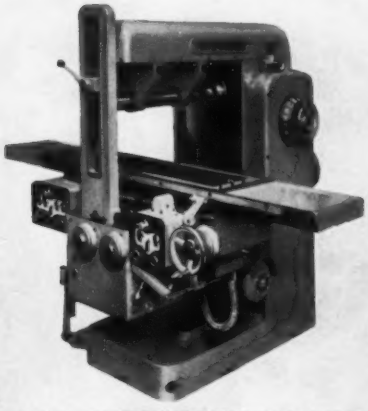


Production Millers, 0-4

Fritz Werner automated, three-dimensional program-milling saves 40% to 75% over conventional vertical or horizontal milling. The Werner method is simple and easy to maintain. Investment is comparatively low, and in addition, the machine can still be used over its full range for either automated or conventional milling.

Left: Plain Millers, 1-6

Below: Universal Millers, 1-4

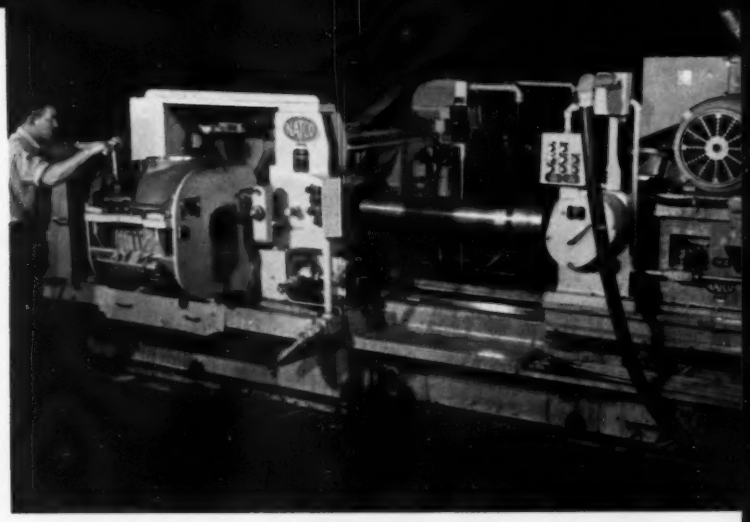


Send for illustrated booklet describing FRITZ WERNER program-controlled milling, and how it can pay you dividends on both long- and short-run milling jobs.

MARAC
MACHINERY CORPORATION
108 Grand Street
White Plains, New York

NATCO

Flopover cradle makes for unobstructed top loading. Holes are bored in two directions without change of setup in this off-highway truck differential carrier assembly.



L-shaped Natco special for boring right-angle holes has both rough and finish cycles. It handles two sizes of parts.

Handling Ease Alone Justifies This Natco Special

This husky Natco does one job well—It bores big holes in hard-to-handle, heavy cast steel parts.

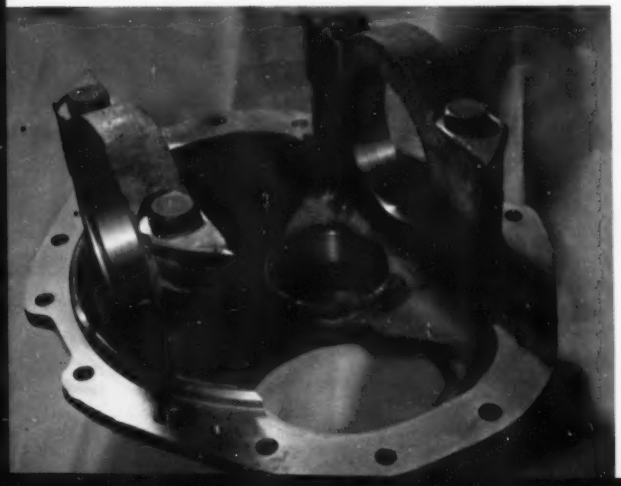
International Harvester Co., Melrose Park, Ill., cuts handling time in half with this Natco special, and look what else it gets: better finish on the bores, longer tool life, improved alignment, tighter tolerances, and more parts per hour. In short, higher quality and greater productivity. And a standard boring mill is released for general purpose chores.

For such extra benefits from specials, call your Natco representative today.

NATCO

The National Automatic Tool Company, Inc., Richmond, Indiana

Only two boring bars with expanding bit heads are needed to bore these several different diameters and faces.



Bits expand from boring heads. Head entering at top bores 4.725″ and 10.250″ holes at the same time.

Reliance Super 'T' V★S Drives

3 dimensional milling machine powered by RELIANCE V★S DRIVE

The Ames Aeronautical laboratory at Moffett Field, California, uses this milling machine capable of producing a complex curvature such as airfoil model in one milling operation. The machine weighs 150 tons, and was designed and built by Danly Machine Specialties, Inc.

A Reliance V★S Drive was specified by Danly to power this new mill because of its ability to perform accurately, even under adverse conditions.

Working at tolerances of better than plus or minus 0.004 in., the Reliance V★S Drive must provide variable speeds between the milling cutters which shape the blank and the pattern table where the pattern is mounted.

Completely powered by a Reliance V★S, this new machine can sculpture in metal a complex airfoil shape at a fraction of the time and cost required to produce a similar shape by conventional machine tool and handwork methods.

Write or call for further details. D-1565-A

Product of the combined resources of Reliance Electric and Engineering Company and its Master and Reeves Divisions

RELIANCE ELECTRIC AND ENGINEERING CO.

DEPT. 34A, CLEVELAND 17, OHIO
Canadian Division: Toronto, Ontario
Sales Offices and Distributors in Principal Cities

Duty Master A-c. Motors, Master Gearmotors, Reeves Drives, V★S Drives, Super 'T' D-c. Motors, Generators, Controls and Engineered Drive Systems.

POSITIVE DUPLICATION—EVERY TIME!

With these three metronomes—or with a thousand—the time interval you choose can be positively duplicated time after time after time. And with these three PD® surface wheels—as with *all* CINCINNATI PD GRINDING WHEELS—you'll get the same kind of Positive Duplication *every time*!

HERE'S WHY . . . IN 36 STEPS

There are 36 unvarying quality control steps in Cincinnati's unique PD manufacturing process. Right from the start with the choice of the "grains" that go into a wheel, PD procedures involve exacting checks and re-checks. Every grain characteristic—from size, cleanliness, absence of foreign matter, color, magnetic content, to bulk density before and after blending—must fully satisfy extraordinary PD specifications, which are followed throughout in all 36 rigid controls.

RESULT: PREDICTABLE PERFORMANCE

You can depend on the uniformity of PD WHEELS—for each reorder wheel gives you exactly the same good job as the original. Production goes up and stays up. Costs go down and stay down. This is the promise—and performance—of Positive Duplication.

CALL CINCINNATI TODAY

Solve your grinding problems with the help of our Cincinnati-trained specialists. Their wide experience in job set-ups and grinding operations is at your service. Just call your CINCINNATI PD GRINDING WHEEL Distributor, or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

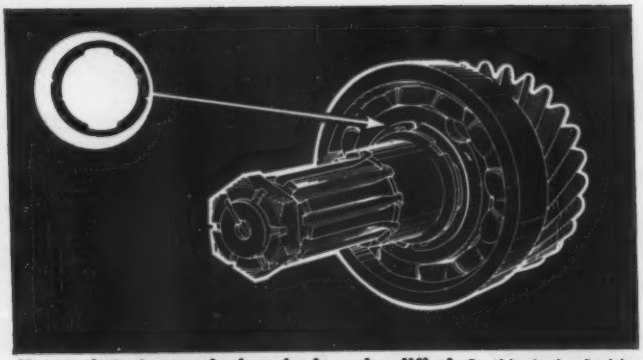
PD POSITIVE DUPLICATION

CINCINNATI®
GRINDING WHEELS

®Trade Mark Reg. U.S. Pat. Off.

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

For more data circle this page number on card at back of book



Heavy duty transmission design simplified. On this dual axle drive for trucks, a Truarc Series 5107 ring locks bearing on drive shaft. Interlocking ring design won't dislodge under heavy torque . . . is also recommended for high rpm. applications.

Designing with radially assembled Waldes Truarc retaining rings

solve varied product design problems—save machining, materials, parts and labor

Radially assembled retaining rings, which snap onto a shaft at right angles to its axis, greatly extend the range of products on which retaining rings may be used to simplify design and save parts or labor costs.

For example, rings for radial assembly can be used in applications where it is impossible to install a ring axially over the end of a shaft. Certain types are designed to accommodate shafts of relatively wide tolerances. Others described below may be used to provide a sizeable shoulder on a shaft.

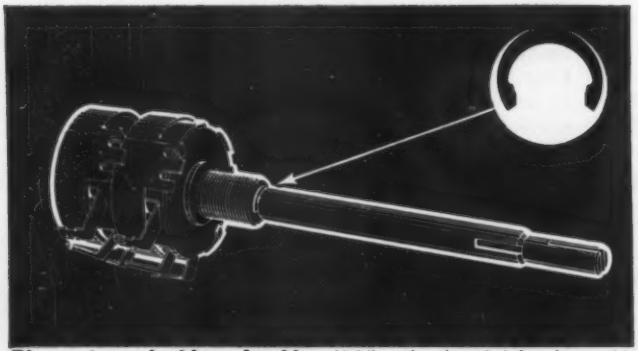
The four applications shown here provide an indication of the wide range of products using radially assembled rings. The rings themselves are basic Truarc types each having specific design features. The high shoulder of one provides a large bearing surface on small diameter shafts; the low shoulder of another is ideal where clearance is limited. A third has an interlocking design which prevents it from being dislodged under torque or high rpm. A fourth can be used against rotating parts at the same time it provides spring tension.

These are but four of Truarc's fifty functionally different types of retaining rings with up to 97 sizes within a single type, six metal specifications and thirteen different finishes. Special hand, magazine, and semi-automatic applicators as well as grooving tools are also available to speed production. The entire line, together with over 70 typical applications, is described and illustrated in the new catalog RR10-58—yours for the asking. And call on us for design assistance on your specific project . . . a Waldes Truarc engineer will be glad to help. Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N. Y.

© 1959 WALDES KOHINOOR, INC. 9.0

Rings replace machined shoulders, collars, set screws. That's what original design of this pneumatic temperature transmitter called for. Series 5139 Prong-Lock® ring with bowed design compensates for accumulated tolerances in parts, provides sufficient friction to prevent rotation under vibration. At the same time two Waldes E-rings position and lock adjustment screw to face plate.

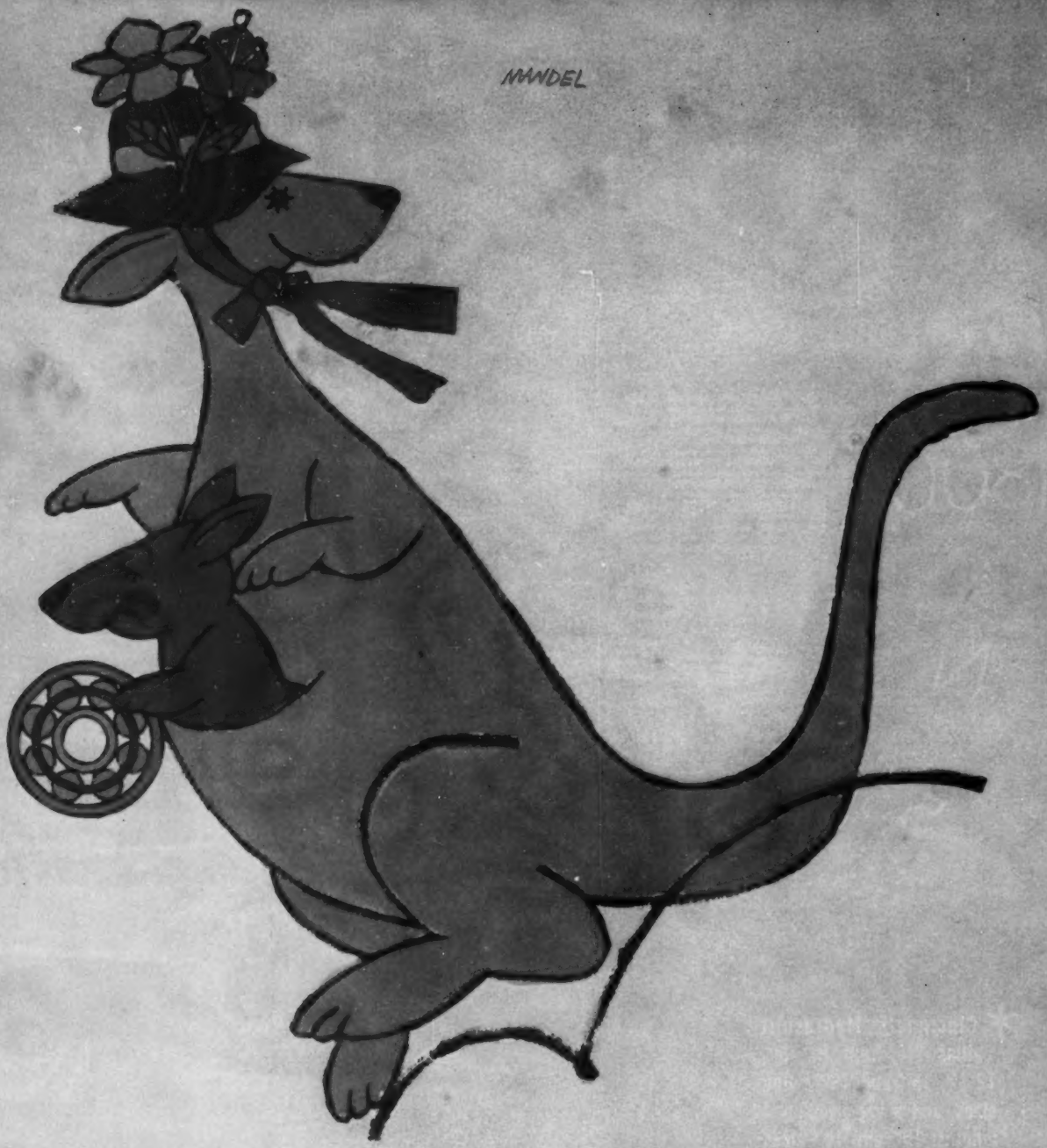
Reinforced aluminum ring gives design advantages on louver windows. Waldes Truarc Series 5144 reinforced rings of aluminum secure hinge pins, eliminate costly riveting in linkage of louver type window. Ring design provides large bearing shoulder. Reinforced construction has 5 times the gripping strength of standard E-ring construction, allows use of non-corrosive aluminum.



Ring acts as locking shoulder. Holding the threaded ferrule on this potentiometer shaft is a Truarc Series 5103 Crescent® ring. Crescent ring design with low shoulder provides ample clearance for assembly of panel locknut. It is less costly than a machined shoulder, more effective, quicker to install, easier to remove than the C washer previously used.

WALDES
TRUARC®
RETAINING RINGS
Waldes Kohinoor Inc., Long Island City 1, N. Y.

TRUARC RETAINING RINGS...THE ENGINEERED FASTENING METHOD FOR REDUCING MATERIAL, MACHINING AND ASSEMBLY COSTS



HIGHER SPEEDS

The raceway of a Federal Ball Bearing is designed to do just what its name implies—provide a track around which balls can whirl at lightning speeds, without fatigue. To make sure they do, every Federal Bearing starts with tough SAE 52100 steel. Scores of production and quality control steps later, a perfect ball bearing emerges, primed to perform its high speed tasks.

Smoothly. Quietly. Efficiently. And where do we send these smooth, quiet, efficient bearings? Our customer list is a veritable who's who of American industry. We'd like to include your name, too. Our catalog lists over 12,000 ball bearing sizes and hundreds of types. Send for it today.

THE FEDERAL BEARINGS CO., INC., Poughkeepsie, N. Y.

Federal

BALL BEARINGS

One of America's largest ball bearing manufacturers

FEDERAL ON FILM—A 16 mm. color sound film takes you through our 400,000 sq. ft. plant. Loaned free. Just ask for it.

*Cincinnati Hydrashift Lathes are built in 10", 12½", 15" and 18" swing sizes, and a variety of bed lengths. 15" and 18" sizes may be equipped with Cincinnati HYDRAGUIDE tracers for even greater productivity.

Ask your Cincinnati Lathe and Tool Dealer about this exciting new development from CINCINNATI, or write to its direct.

from cincinnati lathe and tool

CINCINNATI HYDRASHIFT*

The first economy-priced geared head lathe with
POWER DIAL SPEED SHIFTING

HYDRAULIC POWER SUPPLIES THE MUSCLE ON NEW CINCINNATI HYDRASHIFT LATHES

Standard equipment on the new Cincinnati lathes includes HYDRASHIFT, the easiest and fastest method for spindle speed shifting on a geared head lathe. To change spindle speeds, the operator has only to dial the desired RPM . . . *hydraulic power supplies the muscle for the shift.*

New Cincinnati Hydrashift lathes are designed to provide more time for cutting and to reduce operator fatigue to a minimum. Yet, with their many new operating features, *they are still in the economy price class.*

new . . . FROM HEADSTOCK TO TAILSTOCK

new High Speeds with All-Geared Headstock—husky Hydrashift gearing provides 12 speeds in geometric progression up to 3000 RPM.

new Compound and Cross Slide—wider, stronger for heavy, high speed cuts; large, easy-read dials for greater accuracies with more operator speed and convenience.

new Quick-Clamping Tailstock—Cincinnati's unique tailstock design is even more versatile for fast tailstock positioning.

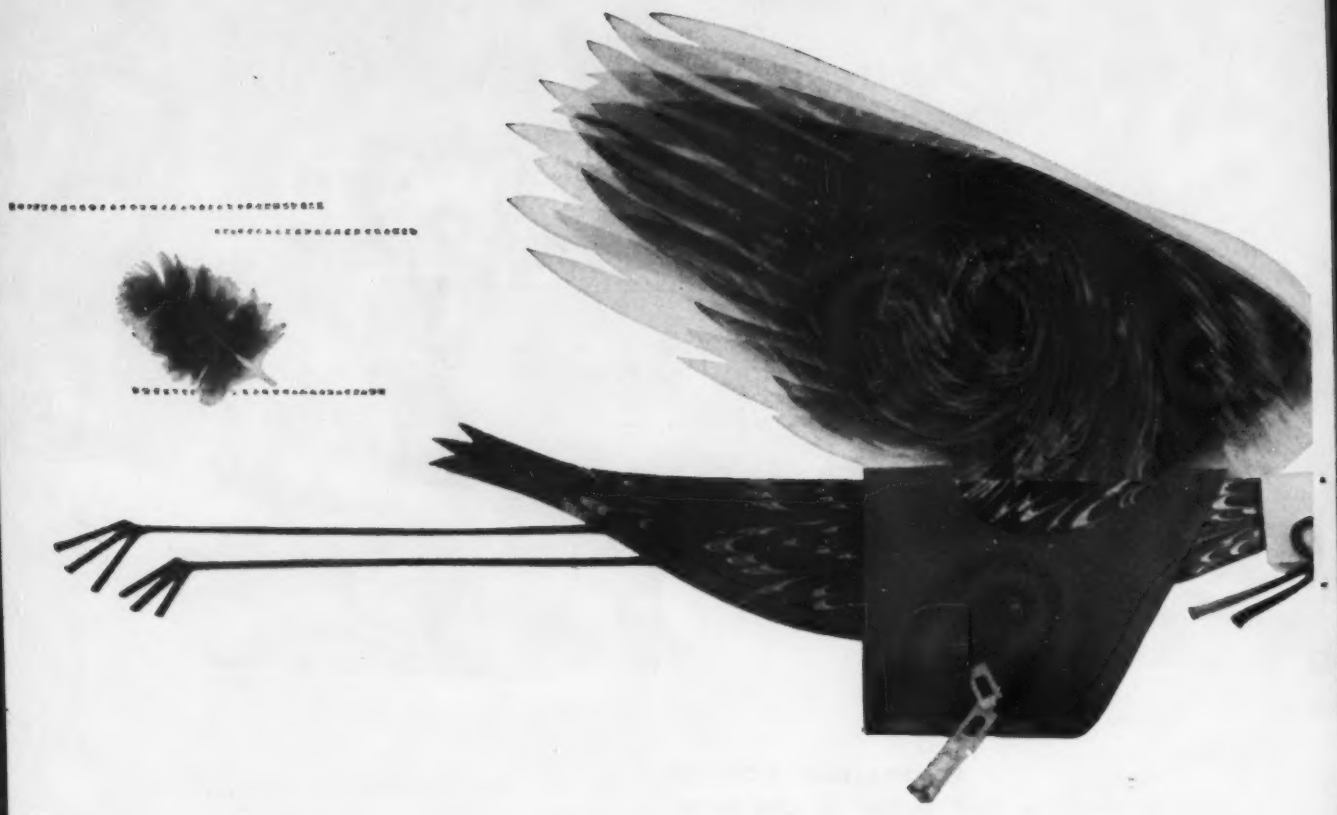
plus —NEW greater horsepower . . . heavy husky beds with "Hardclad" flame-hardened ways . . . NEW coded pushbutton controls . . . NEW chip pan (slides in and out for convenient cleaning) . . . Totally enclosed quick-change feed box with 48 threads and feeds . . . and many other exclusive features on the

NEW CINCINNATI HYDRASHIFT LATHES

cincinnati lathe and tool co.

3207 Disney Street, Cincinnati 9, Ohio

"HYDRASHIFT" Lathes / "CINCINNATI" Drilling Machines / "SPIROPOINT" Drill Sharpeners



BUHR'S "BABY".....

The first major equipment built to the Special Machine Tool Standards is on the way. And it's Buhr's Baby! A lift-and-carry type transfer that will perform 323 precision operations, Buhr's Baby will be the most flexible and readily convertible multiple operation machine tool ever built. Manufacturing was started in December. Future ads will keep you posted on progress.

BUHR MACHINE TOOL COMPANY • ANN ARBOR

Report to the **SMTS** *Committee*

is
.....on the
way!

BUHR
MICHIGAN ECONOMATIC

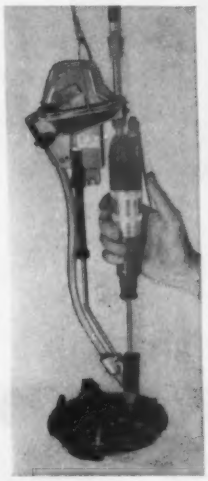
For more data circle this page number on card at back of book

We're all going to STRIPPIT this year!

For a fresh slant on ways to work metal, be sure to see our machines in action at our booth. See how our self-contained punching units eliminate expensive dies, how the Flex-O-Drill sharply reduces template-making time, how our versatile Fabricators simplify pilot and production runs. If you can't make the show, write for General Catalog.

Stop at Booth 1221 ASTME Show April 21-28

SELF-CONTAINED HOLE PUNCHING UNITS reduce tooling to a simple assembly operation. Punches, stripping guides and die buttons are component parts of the unit. Nothing's attached to press ram. No die set required!



STRIPPIT ZIPP SCREW FEEDER feeds and drives all kinds of screws automatically, saves time and trouble on continuous vertical screwdriving operations.

STRIPPIT SUPER "30" FABRICATOR, a 30" throat version of well-known Model 15A. Handles sheets 30" wide for short run punching, 25" x 30" for production hole duplication. Maximum hole sizes: 3½" in 16 ga. and ½" in ¼" mild steel.

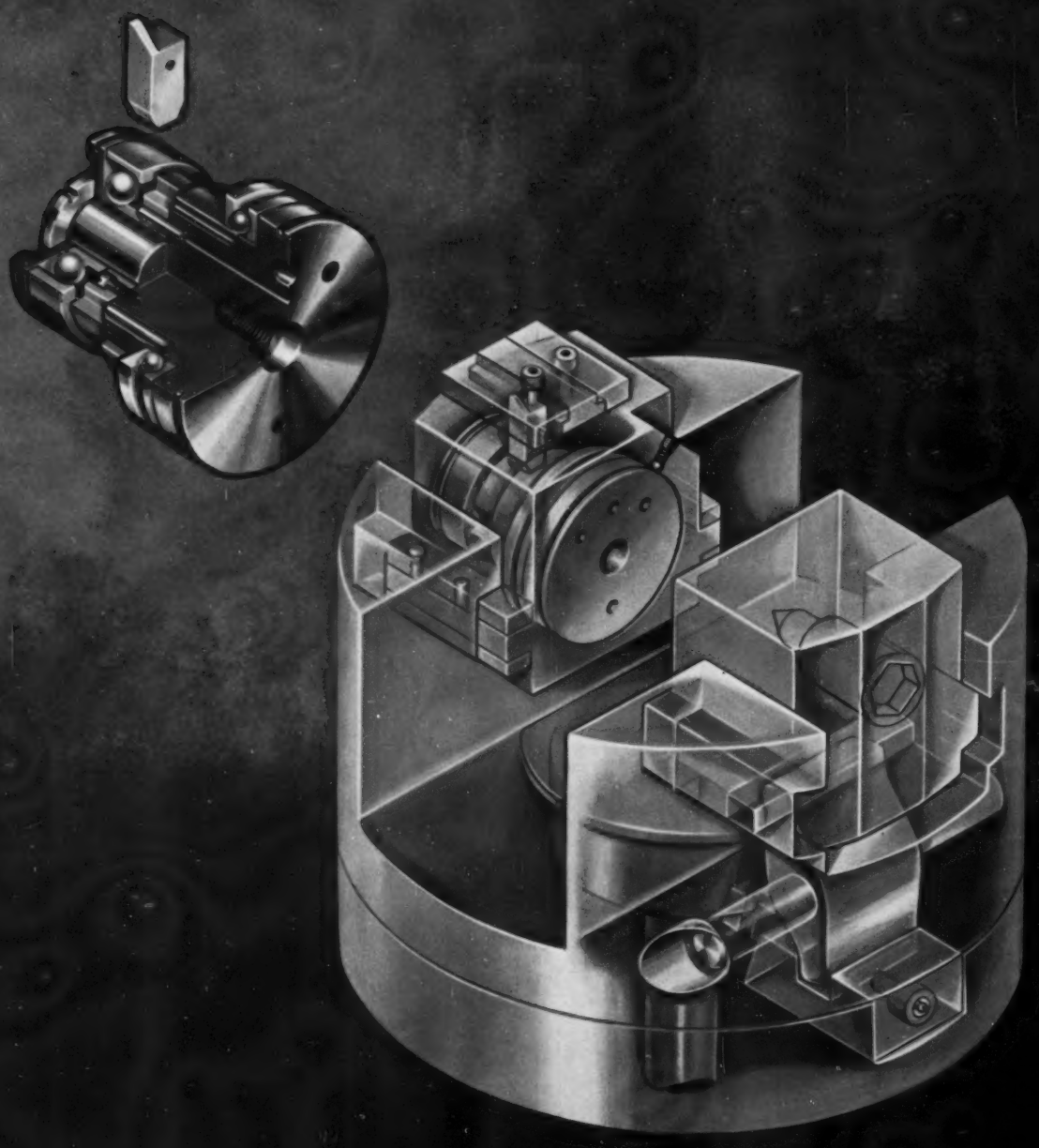
STRIPPIT FLEX-O-DRILL speeds production of accurate templates and layouts. A table-type precision machine for drilling, reaming, center punching and scribing. Flex-O-Drill does away with need for base-line or vernier height gauges. Handles ¼" mild steel up to 24" wide and in any length.

WALES **STRIPPIT** INC.

203 Buell Road • Akron, New York

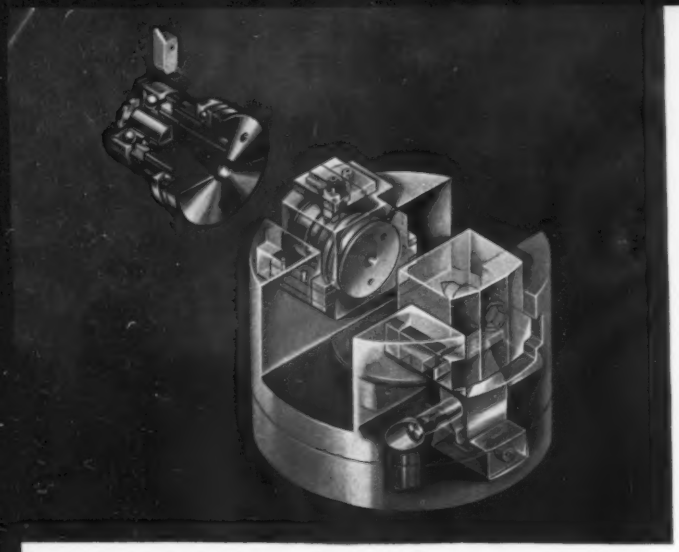
HOUDAILLE INDUSTRIES, INC.

In Canada: Strippit Tool & Machine Company, Brampton, Ontario



Here is another major chuck development from

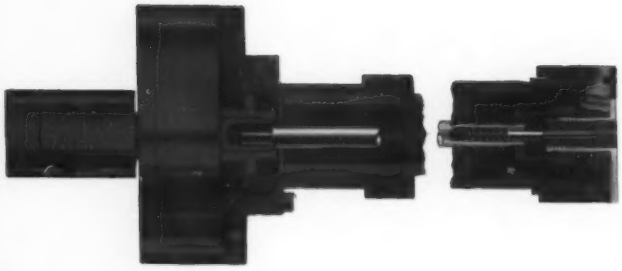
SKINNER



A heavy-duty power chuck with jaws that freely index under full pressure. Indexing is simple, easy, and fast. The operator can index manually without touching the work or releasing the pressure. Jaws are indexed by means of a lock screw and slide plate. Note the size and shape of the indexing pin. It fits firmly and positively into the indexing plate so that extreme accuracy of indexing is assured.

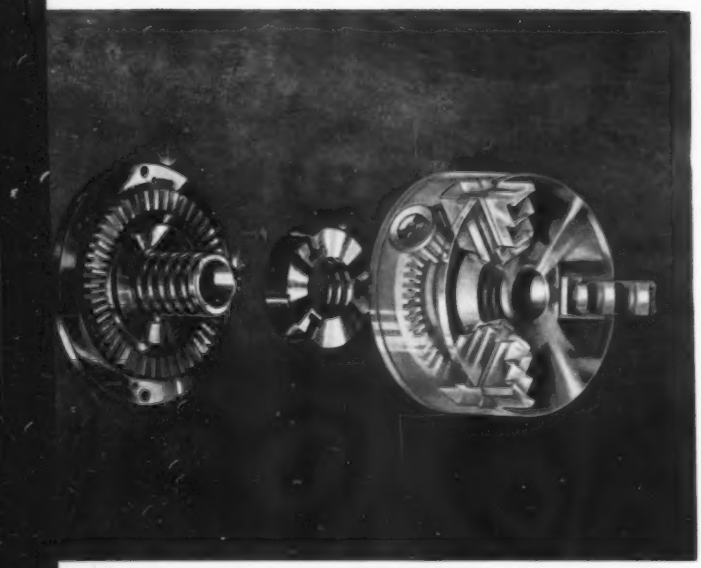
One or both jaws can be furnished with indexing mechanisms. As a result, you can index more positions and smaller index angles. There is no need to buy a new chuck for different indexing positions because index jaws or index components can be interchanged quickly and easily.

This new Skinner chuck is available in all body diameters from 12″ through 36″.



The only power chucking unit for Brown & Sharpe and similar automatic and hand screw machines. The addition of this unit to your screw machine permits power chucking of cold drawn parts, small or odd shapes and castings.

The Skinner unit, recommended by Brown & Sharpe, consists of a 4-inch air chuck with two or three jaws and work ejector, a threaded draw bar, a rotating air cylinder and a cylinder adapter. Hand, foot, or solenoid valves and power chucking accessories are also available. Average installation time—ninety minutes.



The first major chuck development in fifty years! This extra-heavy-duty Wedge-Screw chuck develops tremendous gripping power, high accuracy and repeatability by a unique principle. When the lug-type pinion is turned manually or by a power wrench, it engages the gear plate causing the screw to move the wedge. The force of the wedge on the jaws holds the work with tremendous power.

This Wedge-Screw chuck has such useful features as:

Accuracy—within .001 total indicator reading

Repeatability—within .0005 total indicator reading

Complete Range—no size limitation

Many other features including over-tightening and operator protection, sealed operating mechanism, automatic lubrication, etc.

For more information about these major chuck developments, contact your Skinner representative or write directly to us. Be sure to see all 3 of these products at the ASTE Show, Booth 1338.

SKINNER CHUCKS®

THE CREST OF QUALITY

SKINNERCHUCKS

THE SKINNER CHUCK COMPANY • NEW BRITAIN, CONNECTICUT

Printed in U.S.A.

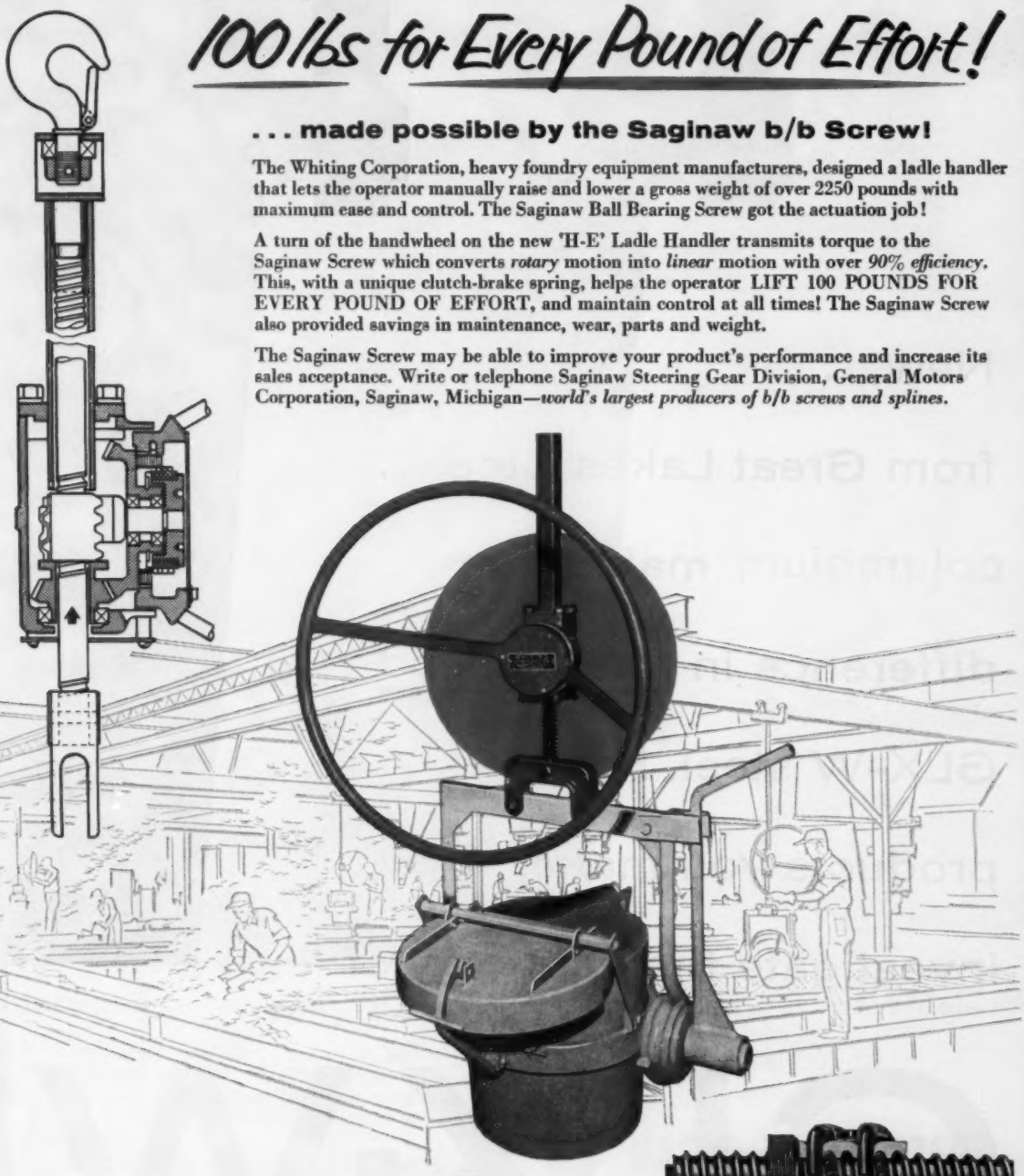
NEW Whiting Ladle Handler Lifts 100 lbs for Every Pound of Effort!

. . . made possible by the Saginaw b/b Screw!

The Whiting Corporation, heavy foundry equipment manufacturers, designed a ladle handler that lets the operator manually raise and lower a gross weight of over 2250 pounds with maximum ease and control. The Saginaw Ball Bearing Screw got the actuation job!

A turn of the handwheel on the new 'H-E' Ladle Handler transmits torque to the Saginaw Screw which converts *rotary* motion into *linear* motion with over *90% efficiency*. This, with a unique clutch-brake spring, helps the operator LIFT 100 POUNDS FOR EVERY POUND OF EFFORT, and maintain control at all times! The Saginaw Screw also provided savings in maintenance, wear, parts and weight.

The Saginaw Screw may be able to improve your product's performance and increase its sales acceptance. Write or telephone Saginaw Steering Gear Division, General Motors Corporation, Saginaw, Michigan—*world's largest producers of b/b screws and splines.*



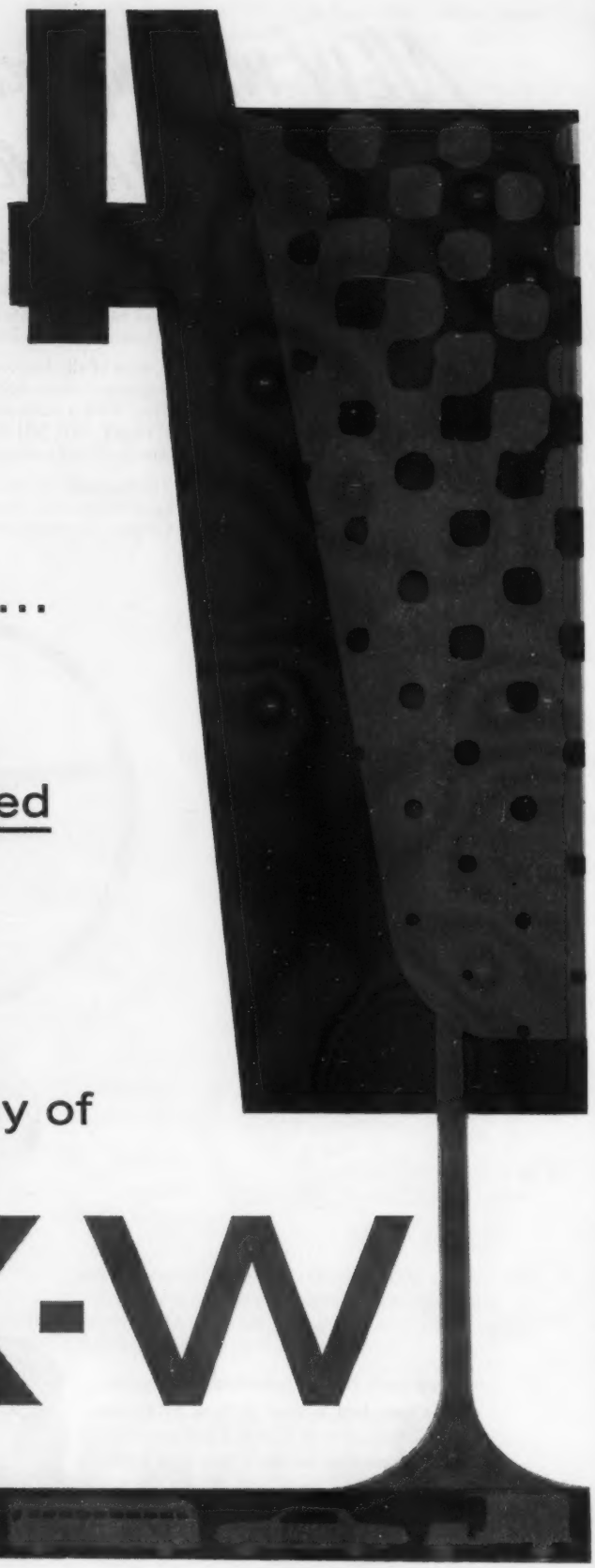
Actuation To Fit Your Individual Requirements

Have been built as small as 3/16 in. B.C.D. and 1½ in. long, as large as 6 in. B.C.D. and 40 ft. long. Larger sizes can be built to your order.

Saginaw ball bearing Screw

WORLD'S MOST EFFICIENT ACTUATION DEVICE

For more data circle this page number on card at back of book



New...

from Great Lakes Steel...

columbium makes the

difference in fine-grained

GLX-W steel. For the

products you make,

investigate the economy of

GLX-W

Compare the benefits of GLX-W with other mild carbon steels

GLX-W gives you great yield strength—up to 60,000 psi—thanks to the finer grain structure that comes from columbium treatment. This greater strength permits designers to save up to 35% in weight, compared with ordinary carbon steels.

At the same time, GLX-W gives you the formability and weldability—with no underbead cracking—of regular carbon steels. It is recommended for a wide range of applications. Get complete details from our Product Development Division, Dept. T-18.

GLX W

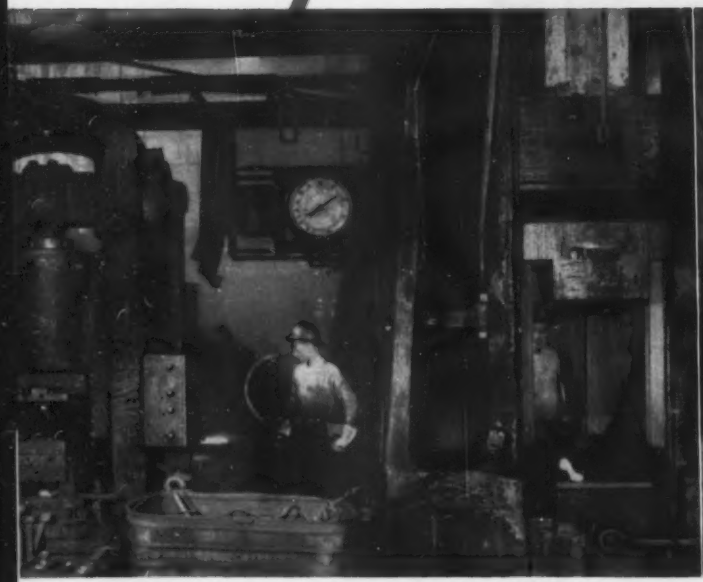
GREAT LAKES STEEL
Detroit 29, Michigan

Great Lakes Steel is a Division of **NATIONAL STEEL CORPORATION**

For more data circle this page number on card at back of book

It's a Push-Button World at Williams

No other manufacturer has the combination of automated equipment to make the finest fit, feel and finish in wrenches!



Forging temperatures for each of Williams' 65 hammers are automatically controlled by sensitive pyrometric instruments which comply with rigid aircraft specifications, MIL-Q-5923C (USAF). The result is tough, fine-grain forgings every time. Die matching is held to close tolerances for maximum structural uniformity.

Special conveyorized heat-treating equipment automatically heats and quenches forgings in a series of salt baths to prevent decarburization and dimensional distortion often found in other wrenches. It further develops the relationship of toughness and hardness to the optimum.

Feel and finish are refined on this automatic profiling machine. All rough edges are completely removed. Wrench handles are profiled to uniform dimensions and are blended into the heads for greatest strength.

Here wall thicknesses are machine-controlled to exact concentricities. This extra step produces heads offering uniform clearances from wrench to wrench... pattern to pattern.

Developed specially for Williams, this three station transfer machine drills, broaches and chamfers. Box openings are machined to tolerances well within industry standards for long-lasting, sure-grip fit.

WILLIAMS' SUPERIOR DESIGN OUT-PERFORMS EVERY OTHER WRENCH

12 Point openings, broached to close tolerances, permit complete nut rotation in 30°

Modified rectangular handle-design offers maximum strength and comfort.

Wall thicknesses designed for maximum strength with greatest clearance.

Satin finish for safe, firm grip. No dirt-catching ornamentation.

Height of box wall correctly proportioned for all nut sizes and series.

Offset forged-in from top of box for the maximum obstruction clearance.

Williams Wrenches measure longer than industry average for extra leverage

INDUSTRIAL DISTRIBUTORS · SERVING INDUSTRY ECONOMICALLY · THE RIGHT HAND OF PRODUCTION

WILLIAMS

W

TOOLS OF INDUSTRY

MR. WRENCH says:

SEND FOR THIS NEW JAM-PACKED CATALOG No. 304. Lists 4530 stock tools and forgings...wrenches of all kinds, power sockets, clamps, tool holders, hoist hooks, eye bolts, and many more...

THE BROADEST LINE OF ITS KIND

J. H. WILLIAMS & CO.

DIVISION OF UNITED-GREENFIELD CORPORATION

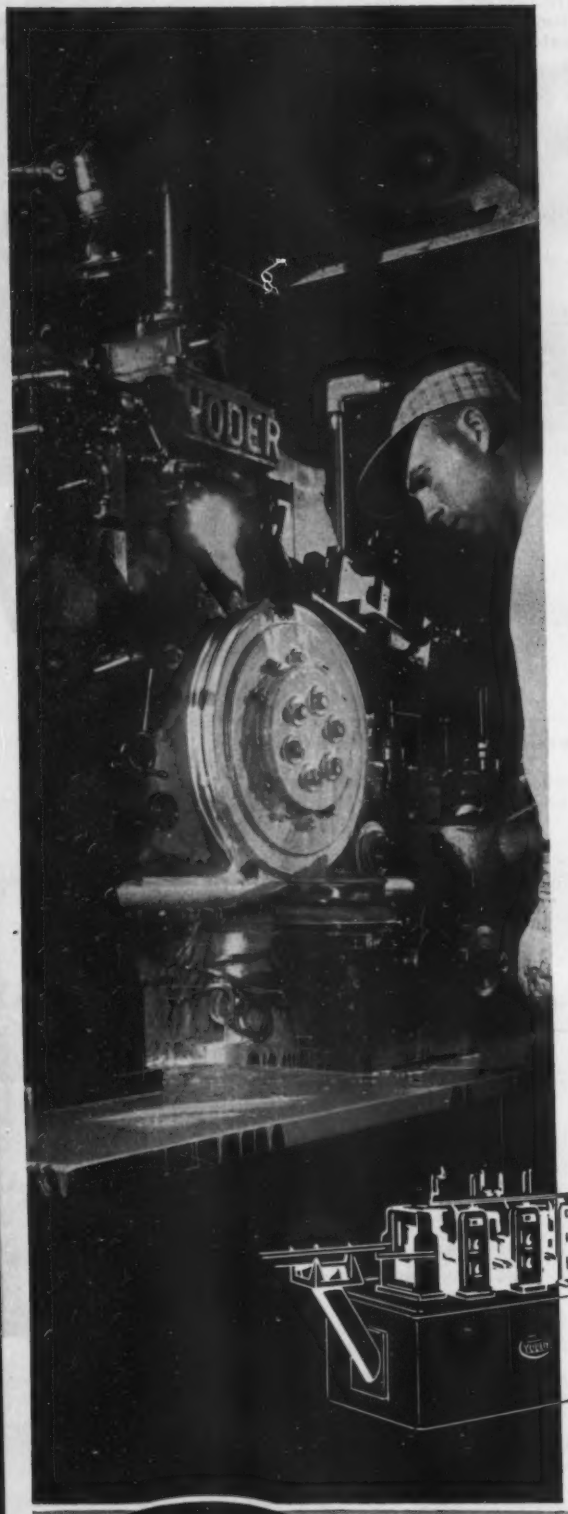
409 Vulcan Street, Buffalo 7, New York

Mr. Wrench: Please send me your new illustrated catalog No. 304.

NAME_____ TITLE_____

FIRM_____

ADDRESS_____ ZONE____ STATE____



Yoder Tube Mills speed tailpipe production at AP Parts Corporation

The AP Parts Corporation (Toledo, Ohio), world's largest producer of replacement mufflers and tailpipes, uses 2 YODER Tube Mills to produce more than *300* ft. of 1¾", 1⅞" and 2" tubing per minute.

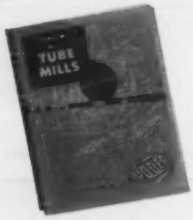
According to Mr. John Grindle, Plant Engineer, the two-man operated YODER Mills are vital to the production of the entire plant. "YODER Tube Mills earn their keep daily. They are easy to set up, maintain and operate . . . the welds are clean and uniform. We depend on them for constant quality, high production and minimum downtime".

The YODER Tube Mills at AP Parts exemplify the production economies and dependability of all YODER-built equipment, whether it be Pipe and Tube Mills, Cold Roll-Forming Machinery or Slitting Equipment.

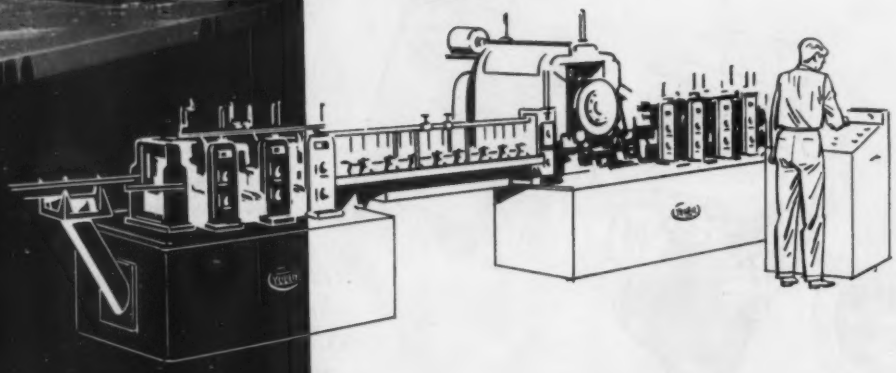
If your products require ferrous or non-ferrous pipe or tubing, from ¼" to 26" diameters, there is a YODER Mill designed to produce it economically, accurately and efficiently.

THE YODER COMPANY

5504 Walworth Avenue • • Cleveland 1, Ohio



For complete information on YODER Pipe or Tube Mills . . . write for the fully illustrated, 88 page YODER Tube Mill Book . . . it is yours for the asking.



ENGINEERING **YODER** MANUFACTURING

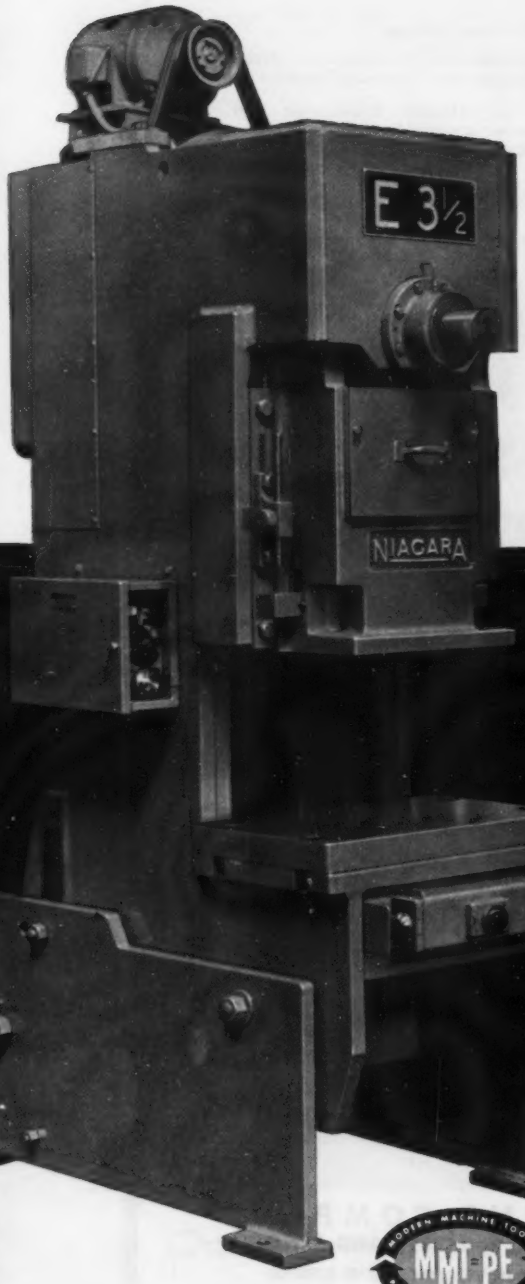
PIPE AND TUBE MILLS (ferrous or non-ferrous)

COLD ROLL FORMING MACHINES

ROTARY SLITTING LINES

NEW! ULTRA-MODERN 45-TON OBI

added to Niagara's exclusive front-to-back crankshaft series



READY FOR YOU

. . . a brand new addition to industry's most advanced line of OBI's! Years ahead of any press within its range, this 45-ton newcomer is available plain or geared. The front-to-back arrangement of its 3½" crankshaft is, of course, a distinguishing mark of Niagara's famous Series E.

No other OBI press design has been so widely acclaimed. And no wonder . . . for no other OBI boasts so many unique advantages:

Full support to wide dies. Greater resistance to off-center loading. Accurate alignment of slide with minimized tendency to cock. Crankshaft deflection minimized. Substantially increased die life. Smoother, safer performance. Exposed overhanging gears, flywheel and other mechanisms eliminated. Less floor space.

GET THE FULL STORY on this new 45-ton wonder-worker as well as the 4 other sizes in the Series E family (up thru 200-ton capacities, and 7½" shaft diameters, standard and automated models). Write for illustrated Bulletin 56.

NIAGARA MACHINE & TOOL WORKS, BUFFALO 11, N. Y.

- Rigid crankshaft with close coupled main bearings each side of crank pin.
- Widest spaced OBI gibbing (L to R) in the industry permits wider box section slide to rigidly support a greater slide face area of full JIC dimensions. Guiding of slide is closer to point of die operation because there is no flange interference with gibbing.
- Longest gibbing in the industry, exclusive multiple "V" type, provides the most efficient guiding and accurate alignment of slide for greatest die life.
- Fully concealed, yet readily accessible, driving mechanism.
- Enclosed, rigidly supported gearing operates in sealed oil bath.
- Low inertia, pneumatic friction clutch and brake operate directly on crankshaft — the slowest rotating shaft.
- Precision, hardened, longer-wearing steel gears.
- Rigid, compact all-steel, box type frame.
- Power slide adjustment and power inclining device operate with new, unequaled speed.

MMT-PE — MODERN MACHINE TOOLS — PRODUCTION EFFICIENCY

NIAGARA

OBI PRESSES SERIES E

DISTRICT OFFICES: Boston • Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia / Distributors in principal U.S. cities and major foreign countries.

For more data circle this page number on card at back of book

There's an AJAX FORGING MACHINE . . .

— For Every Field of Upset Forging in Industry —

BUILT IN TWELVE SIZES 1" to 12"

Choose from a complete line of AJAX Forging Machines to make the forged parts you need—

AUTOMOTIVE — Transmission Gears—Flanged Axle Shafts—Crankshaft Flanges & Drag Links

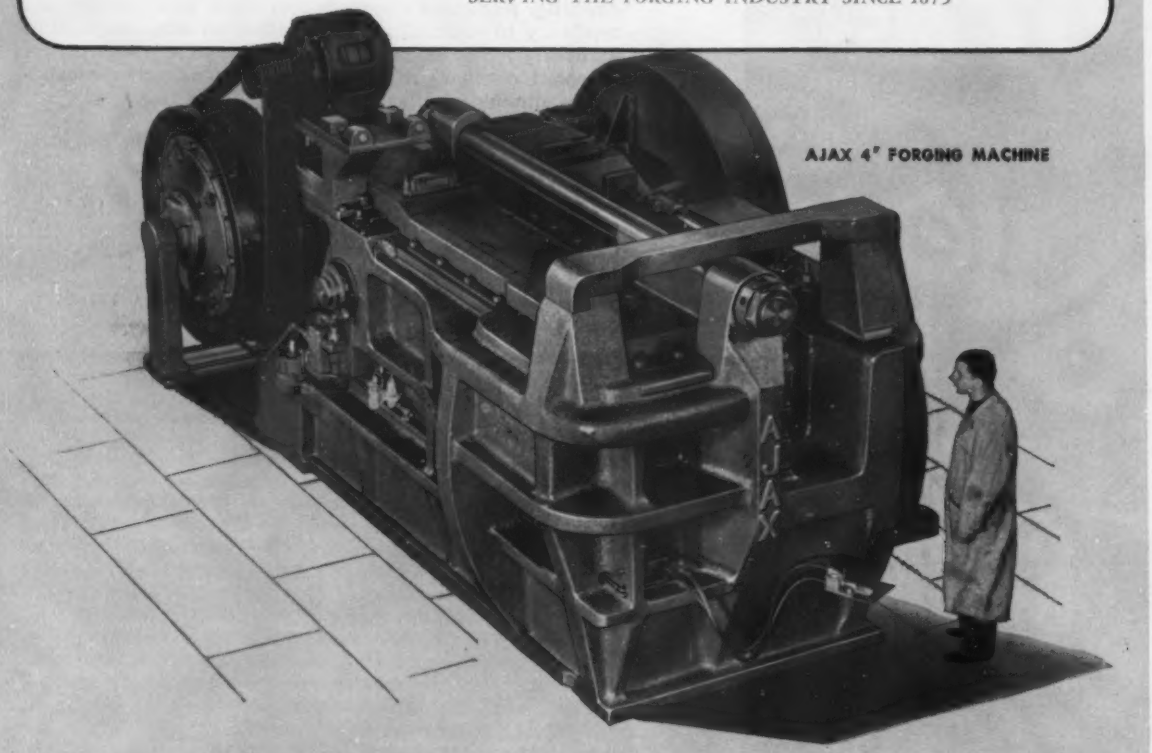
AIRCRAFT—Cylinder Heads & Jet Blade Blanks

AGRICULTURAL—Implement & Tractor Forgings

RAILROAD—Freight Car Brake Levers—Grab Irons & Brackets

For Higher Production and more accurately Forged Parts—Specify AJAX Forging Machinery

SERVING THE FORGING INDUSTRY SINCE 1875



AJAX 4" FORGING MACHINE

THE Ajax MANUFACTURING COMPANY
1441 CHARDON RD. CLEVELAND 17, OHIO

CHICAGO OFFICE: 110 S. DEARBORN ST., CHICAGO 3, ILLINOIS
WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.

FORGING PRESSES | FORGING MACHINES | FORGING ROLLS | AJAX-HOGUE WIRE DRAWERS

For more data circle this page number on card at back of book

For more data on Hannifin Items, Circle No. 67 ➤
For more data on Fittings & Hose, Circle No. 67A ➤

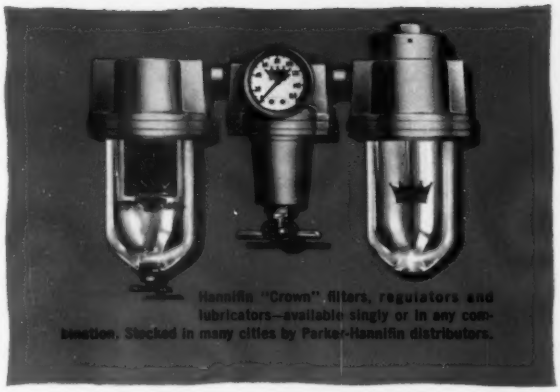
Hannifin air power cylinders, available in a full range of mounting styles, bore sizes from 1½" through 14", strokes to 20 feet. Cylinder bodies bored, then honed satin-smooth . . . for low friction, long packing life.

Hannifin's complete line of air control valves includes electric solenoid-, pressure-, cam-, hand- and foot-actuated valves. Write for our compact new "Valve Finder."

PARKER-HANNIFIN puts air to work without costly leaks

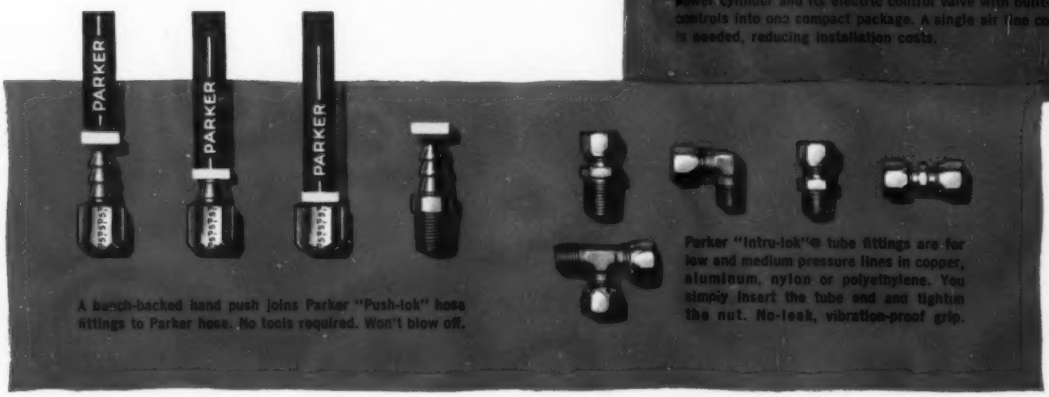
Now...complete pneumatic power systems, engineered for long leak-proof life, are available from your Parker-Hannifin man. Hannifin "Crown" units supply filtered, lubricated air at optimum pressure. Hannifin air valves shift quickly and seal bubble-tight. Hannifin air cylinders and air motors are low-friction, leak-proof. Parker "Push-lok" hose fittings and "Intru-lok" tube fittings provide quick, easy, leak-proof connections. The over-all result is more work from less air!

Our field engineering service helps you design your circuits and select the components. Many items are available locally, from Parker-Hannifin distributor stocks.



Hannifin "Crown" filters, regulators and lubricators—available singly or in any combination. Stocked in many cities by Parker-Hannifin distributors.

The Hannifin air motor combines a high-efficiency, leak-proof power cylinder and its electric control valve with built-in speed controls into one compact package. A single air line connection is needed, reducing installation costs.



A bench-backed hand push joins Parker "Push-lok" hose fittings to Parker hose. No tools required. Won't blow off.

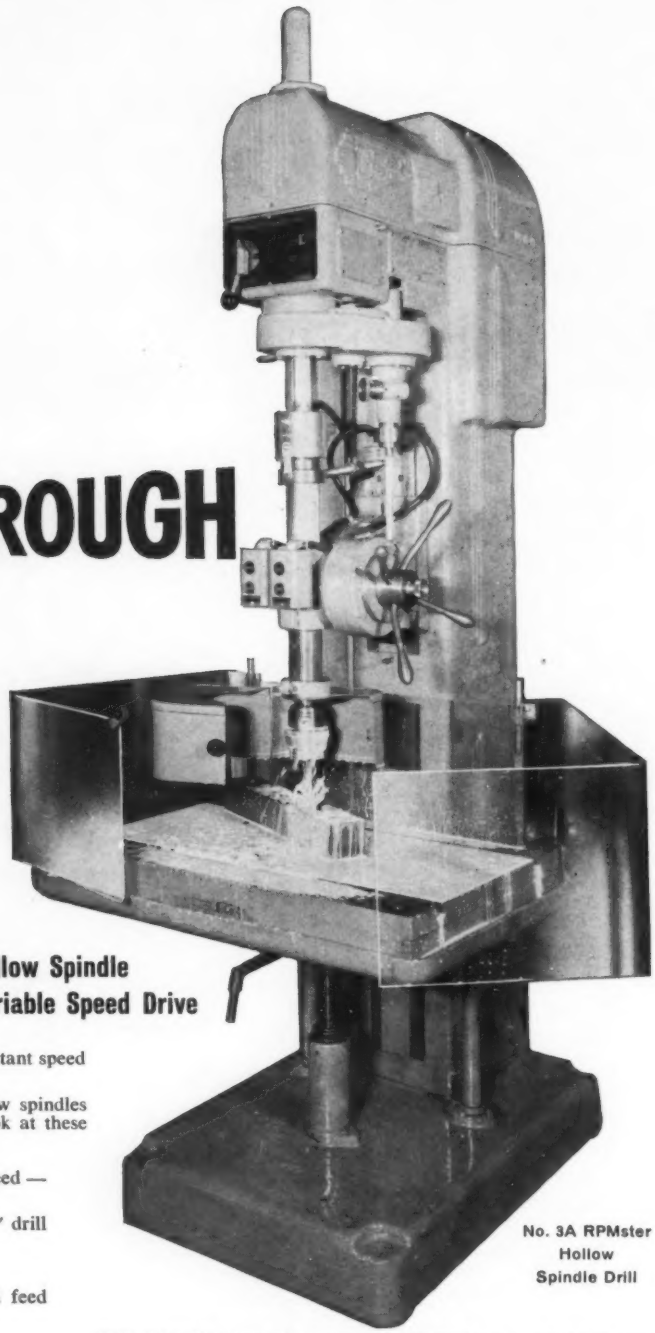
Parker "Intru-lok"® tube fittings are for low and medium pressure lines in copper, aluminum, nylon or polyethylene. You simply insert the tube end and tighten the nut. No-leak, vibration-proof grip.

Parker FITTINGS AND HOSE DIVISION
17325 Euclid Avenue, Cleveland 12, Ohio

HANNIFIN COMPANY
555 S. Wolf Road, Des Plaines, Illinois

NOW A MAJOR BREAKTHROUGH

IN "PROBLEM" DRILLING!



Buffalo RPMster **with**

- **Hollow Spindle**
- **Variable Speed Drive**

Buffalo pioneered the RPMster's variable speed drive — instant speed changes while drilling.

Now, ***Buffalo*** brings you the RPMster with special hollow spindles to shatter concepts of formerly "impossible" drilling. Look at these test results:

316 STAINLESS STEEL — ¾″ drill, 700 rpm, .001″ feed — 4″ deep; ½″ drill, 900 rpm, .001″ feed — 4½″ deep.

TOOL STEEL SHEAR BLADES Hardened to 54 R c. ½″ drill — 800 rpm .001″ feed — 2½″ through.

RENE 41 — ½″ hole @ 750 rpm .001″ — 3″ through.

BERYLLIUM BRONZE — ½″ hole @ 6200 rpm hand feed through 2½″ in 1½ seconds.

TITANIUM — ⅜″ hole @ 1000 rpm .002″ feed.

CAST IRON — ¾″ hole @ 2000 rpm. 004″ feed.

52-100 ALLOY STEEL — 7/16″ hole @ 800 rpm .001″ feed.

No. 3A RPMster Hollow Spindle Drill

SEE FOR YOURSELF. At no obligation, send a sample of any hard-to-drill material to the factory. We will test-drill it and return the sample with a report on the drilling tests. Send your sample today, and write for details!

"Buffalo"

BUFFALO FORGE COMPANY

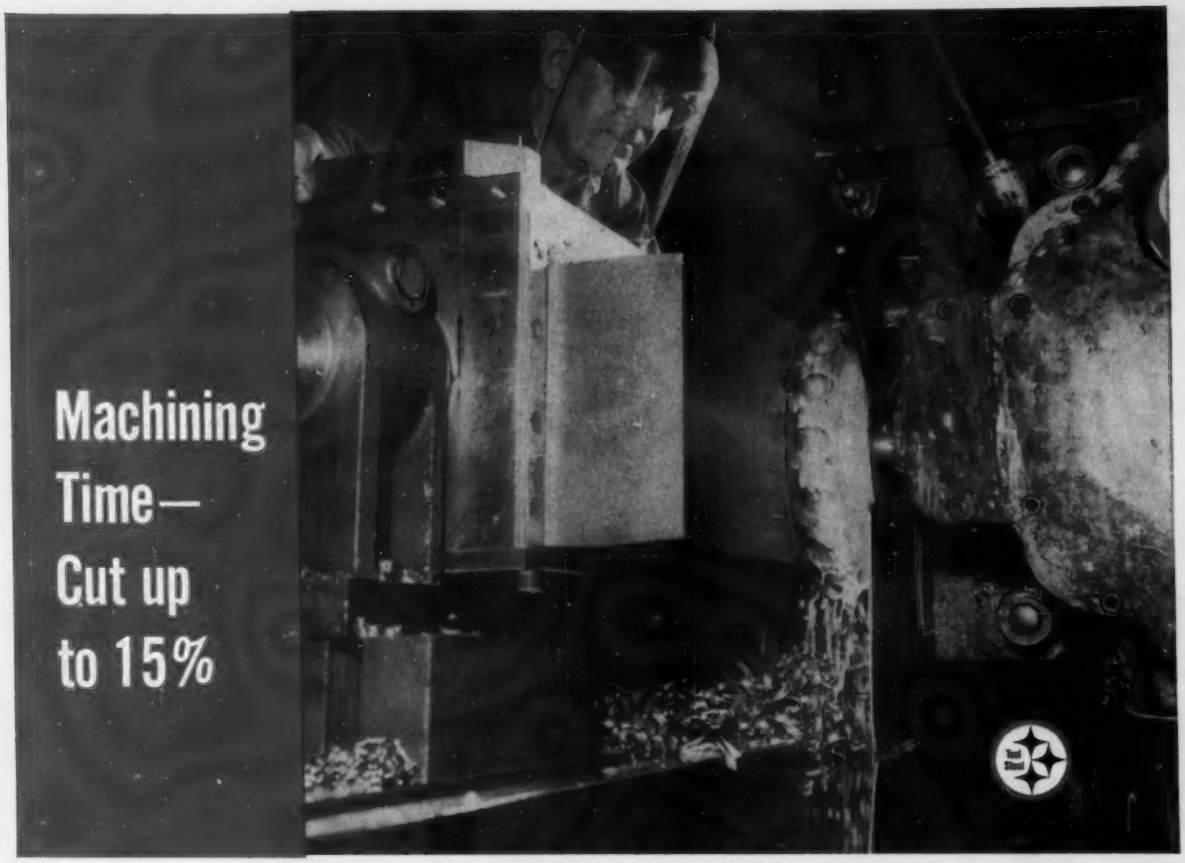
BUFFALO, NEW YORK

Buffalo air handling equipment to move, heat, cool, dehumidify and clean air and other gases.

Buffalo Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

Buffalo Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.



Dependable DESEGATIZED® FM Die Steels

. . . easier to work . . . easier to machine

In the production of thousands of metalworking dies, the properly dispersed alloy sulphides in Latrobe's FM High Alloy Die Steels have permitted increased feeds and speeds—*machining time cut up to 15% in most cases!* This cost-saving production is possible with no sacrifice of the excellent toughness, wear resistance and hardenability properties of the steel.

FM die steels are produced by Latrobe's Desegatized process of manufacture. This process guarantees full structural uniformity of the steel—an even distribution of the all-important carbide particles and "free-machining" alloy sulphides—your assurance of dependable quality.

Four grades of 12% chromium FM steels are regularly stocked: Olympic FM (type D-2) for long-run applications; BR-4 FM (type D-7) for extreme abrasion resistance; GSN FM (type D-3) for severe non-deforming requirements; Cobalt Chrome FM (type D-5) for extra resistance to galling and pickup.

For better die steels and technical service, call your nearest Latrobe representative. Literature on grades available upon request.

Skillfully made in U.S.A. by . . .

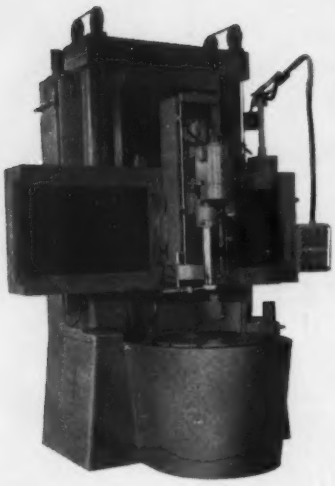
LATROBE Metalmasters

LATROBE STEEL COMPANY
LATROBE, PENNSYLVANIA

BRANCH OFFICES and STEEL SERVICE CENTERS: BOSTON • BUFFALO • CHICAGO CLEVELAND • DAYTON • DETROIT • HARTFORD • LOS ANGELES • MIAMI • MILWAUKEE NEW YORK • PHILADELPHIA PITTSBURGH • SAN LEANDRO • TOLEDO

For more data circle this page number on card at back of book

Vertical Universal Grinders



model 3-TR
52″ swing

Springfield vertical universal grinders are among the most versatile tools you can use for *both* production and toolroom work. Head is easily positioned to grind ODs, IDs, surfaces, offsets and undercuts in *any* combination, generally with one chucking. Work may be regular or irregular in shape, up to 48″ high with up to 52″ swing on standard machines. Weight of workpiece is no problem because gravity works for you in vertical grinding – helps achieve extreme micro-inch finish and concentricity.

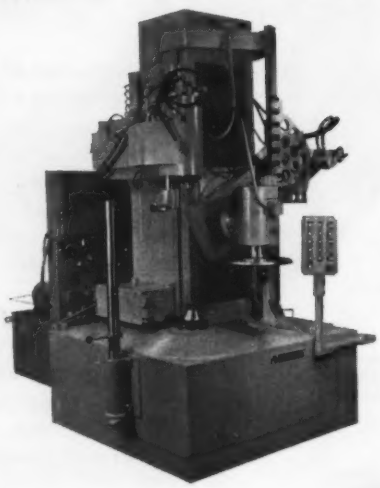
A typical example of a Springfield's remarkable precision is its ability to grind taper valve plugs and seats with one angle setting of the head–and get 95% blue or better on a taper gage with surface finish smoother than 30 RMS.

For high production, sometimes involving automatic loading, cycling, size control and unloading, Springfield builds special vertical grinding machines. Most of these can be reset when part changes occur. Another area in which Springfield has pioneered is in vertical contour grinding machines that handle missile parts.

If you would like to know more about Springfield vertical grinders, please write for Bulletin 197-G.

MMT=PE

new developments coming!



vertical contour grinder

SPRINGFIELD

The Springfield Machine Tool Company
Springfield, Ohio

"Our new Bliss makes 16 of these a minute...

...direct from coil stock." Automating bearing cage production was a key objective of the modernization program recently undertaken by The Timken Roller Bearing Company. And close cooperation between Bliss transfer feed specialists and Timken production men resulted in a press that does the work of a number of older ones—it automatically feeds heavy gage coil stock in and finished cages out—sixteen of them every minute. If more parts for less money is your pressing problem then by all means send for our illustrated transfer feed bulletin. It's packed with some unusual applications of the transfer principle. Perhaps there's an idea here for you...

BLISS
SINCE 1857

E. W. BLISS COMPANY · Canton, Ohio

BLISS is more than a name—it's a guarantee

For more data circle this page number on card at back of book

T. R. DREYER, Vice President—Brooklyn Manufacturing
American Machine & Foundry Company

a man who came to Fair Street

"The JIGMIL Technique enabled us to establish new manufacturing methods which provided greater accuracy, improvement in our product, substantial reductions in assembly time, and major reductions in machine time, all without investment in jigs."

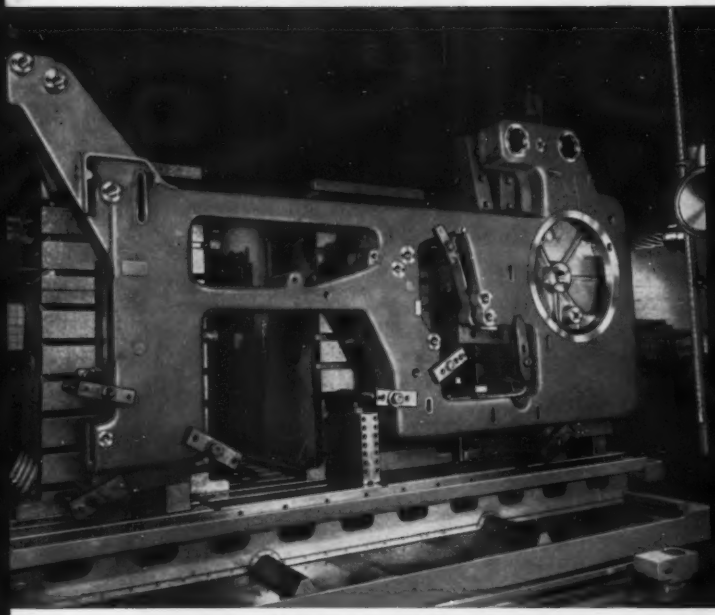
"We accepted an invitation to go to Fair Street and there saw the JIGMIL Technique in operation doing boring and milling to high degrees of accuracy and economy. The potential savings in our own plant became apparent and we developed a JIGMIL program which resulted in new economies in our manufacturing methods. The inherent accuracy, power and rigidity of this machine tool, combined with its automatic positioning and ease of operation are especially adaptable to precision boring and milling operations on side frames and gear boxes. In addition to the noteworthy savings in boring time and reduced tooling cost, we gained the advantage of milling in the same setting at a minimum of cost."

T. R. DREYER

DE VLIEG MACHINE COMPANY, FAIR STREET, ROYAL OAK, MICHIGAN

SOME OF OUR JIGMIL USERS

Aerojet-General Corp.
American Can Co.
Avco Manufacturing Corp.
Baldwin-Lima-Hamilton Corp.
Beech Aircraft Corp.
Boeing Airplane Co.
Boyar-Schultz Corp.
Carrier Corp.
Clark Equipment Co.
Continental Can Co., Inc.
Convair, A Division of General Dynamics Corp.
Crankshaft Machine Co.
The DeLaval Separator Co.
Detroit Broach Co.
Douglas Aircraft Co., Inc.
Eastman Kodak Co.
Emsco Manufacturing Co.
The Falk Corp.
Foote-Burt Co.
Goss Printing Press Co.
Grumann Aircraft Engineering Corp.
Hamilton Ltd., Division, United Aircraft Corp.
Hardinge Bros., Inc.
The Heil Co.
Illinois Tool Works
Ingersoll-Rand Co.
LeTourneau-Westinghouse Co.



A FEW PROVEN ADVANTAGES OF THE JIGMIL TECHNIQUE—

- Eliminates cost of expensive jigs and production delays resulting from their manufacture.
- Simplifies tooling.
- Employs automatic functions to reduce factors of human error even in close tolerance work.
- Makes possible greater flexibility of product design.
- Improves end product by permitting interchangeable assembly of parts without hand fitting.
- Increases production and product accuracy.

ACCURACY IS AN ECONOMY!

A TYPICAL EXAMPLE OF JIGMIL VERSATILITY

AMF uses the JIGMIL Technique for machining a multitude of components for their cigarette making machines, bread-wrapping machines, automatic pin setters, cigar making machines and many others. Illustrated is a pair of bread-wrapper side frames set against angle blocks on a Model 4B-96 SPIRAMATIC JIGMIL. All boring and side milling operations were done on the JIGMIL in one setup. Previous time on conventional boring and milling machines was 10 hours per part. Time on the JIGMIL is 3 hours per part.

The Glenn L. Martin Co.
Michigan Tool Co.
North American Aviation, Inc.
Northrop Aircraft, Inc.
Otis Elevator Co.
Pratt & Whitney Aircraft Division, United Aircraft Corp.
Solar Aircraft Co.
Speco Division, Kelsey-Hayes Co.
Thompson Products, Inc.
United Shoe Machinery Corp.
Western Electric Co., Inc.
Yale and Towne Manufacturing Co.
York Corp.

WILL YOU BE THE NEXT TO VISIT FAIR STREET

Model 4B-96 SPIRAMATIC JIGMIL as used by American Machine & Foundry Co.

For complete information on DeVlieg Spiramatic Jigmills, send for new catalog.

DeVlieg

SPIRAMATIC JIGMILS®

ACCURATE HOLES AND FLAT SURFACES IN PRECISE LOCATIONS

VISIT OUR BOOTH

'60

DETROIT APRIL 21-26 ASTE TOOL SHOW

BUX 2242

NEW! BUX RADIAL POSITIONER

Accurate Drill Positioning— FAST!

New, positive mechanical-action Bux radial positioner assures faster, accurate alignment of Bux portable magnetic drill presses. Magnetic base remains stationary, safely holding unit to work on any *overhead* or *vertical* flat working surface. Full 330° positioning rotation. Lateral movement provided assures precision positioning for drilling, reaming, tapping. Available on Bux magnetic drill press models L-2RP and L-3RP.

LIFTING MAGNET

Cap. 3000 + lbs

by BUX

FEATURES:

- Absolutely Permanent Ceramic Magnets
- Never needs "recharging"
- Lifts better than 3000 lbs
- Magnet cannot be turned off when in use.
- 6½" x 13" lifting face
- No wet batteries or acid
- Needs no wires (electric)

BUX magnetic products

A Subsidiary of O. S. Walker Co.

BUCK MFG. CO.
P.O. Box 692
1355 North 10th St.
San Jose, Cal.

VISIT OUR BOOTH

'60

DETROIT APRIL 21-26 ASTE TOOL SHOW

Walker 2242

AT THE SHOW-

NEW!

CERAMAX ROTARY CHUCK

with Ceramic Magnets for Turning and Grinding

New Ceramax Rotary chucks with permanent ceramic magnets are powerful enough for safe rugged lathe work as well as grinding. All *steel* top plate construction. Variable holding for easy work positioning. Simplified spindle mounting has no collector rings or brush units. In the locked ON position, chuck will *not* demagnetize. Rotationally balanced whether in "ON" or "FREE" position. Available in sizes from 4" to 12" diameters.

O.S. Walker

O. S. WALKER CO. INC., WORCESTER, MASS.

Original Designers & Builders of Magnetic Chucks

VISIT OUR BOOTH

'60

ASTE TOOL SHOW

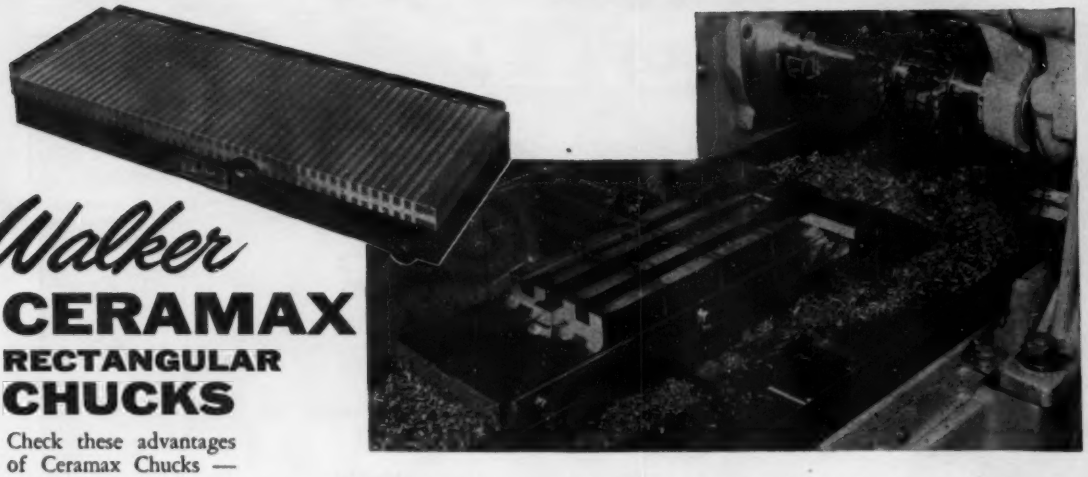
Walker 2242

VISIT OUR BOOTH

'60

ASTE TOOL SHOW

Walker 2242



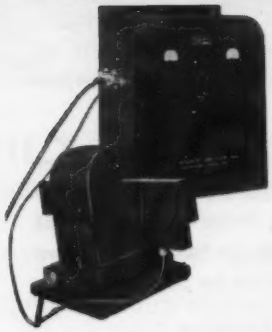
Walker CERAMAX RECTANGULAR CHUCKS

Check these advantages of Ceramax Chucks —

- Holding power extends to periphery of chuck.
- Silver brazed all-steel top plate.
- No magnetism imparted to work; chips and grit fall freely from work surface.
- No soft gap strips in which chips become imbedded — eliminates constant redressing.
- Three times coercive force of ordinary Alnico magnets.
- ¼" pole spacing.
- Low in height for greater machine capacity.
- Sizes from 4" x 4" to 12" x 24".

NO MATTER HOW COMPLEX YOUR PROBLEM

Walker has the know-how to solve it!

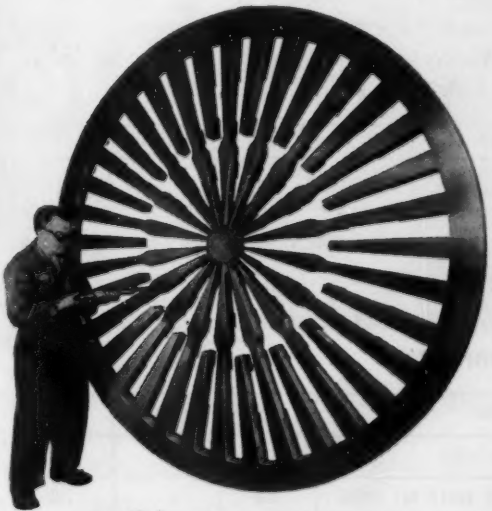


Here are three typical instances of how O. S. Walker, can solve unusual problems for customers.

Above — A large three faced electro magnetic chuck measuring 13½" x 22" x 158" especially built for the knife grinding industry.

At right — A 96" diameter rotary auxiliary plate being prepared for production.

Above — An example of Walker engineered demagnetization — a special Saturable Reactor Control Demagnetizer for ball bearings.



O. S. Walker

O. S. WALKER CO. INC., WORCESTER, MASS.

Original Designers & Builders of Magnetic Chucks

For more data circle this page number on card at back of book

CLAUSING COLCHESTER GEARED-HEAD LATHES

Clausing-Colchester 13″, 15″ and 17″ lathes are by long odds the greatest values in lathe history. Note the following outstanding superiorities and rock-bottom prices:

● **WORLD'S FINEST MACHINE TOOL BEARINGS** . . . Tapered roller bearings with oil-flow lubrication. Just look at the size:

LATHE	17″	15″	13″
FRONT SPINDLE BEARING O. D.	7½″	5½″	4″

● **CIRCULAR ACCURACY OF EVERY LATHE IS GUARANTEED TO BE WITHIN .0001″!**

● **BIG SPINDLES WITH LARGER THRU-HOLE CAPACITY:**

LATHE	17″	15″	13″
THRU-HOLE	3″	2″	1½″
NOSE TAPER KEY DRIVE	L-2	L-1	L-0

SEE US AT BOOTH 1931
A.S.T.E. SHOW, DETROIT.

● **INDUCTION-HARDENED BED WAYS** . . . Standard equipment at no extra cost!

● **ALL-GEARED HEADSTOCK** . . . Gears are induction hardened.

● **OIL BATH LUBRICATED HEADSTOCK and QUICK CHANGE GEAR BOX** . . . both totally enclosed.

● **SEPARATE FEED ROD FOR POWER FEEDS** . . . Lead screw is used for thread cutting only.

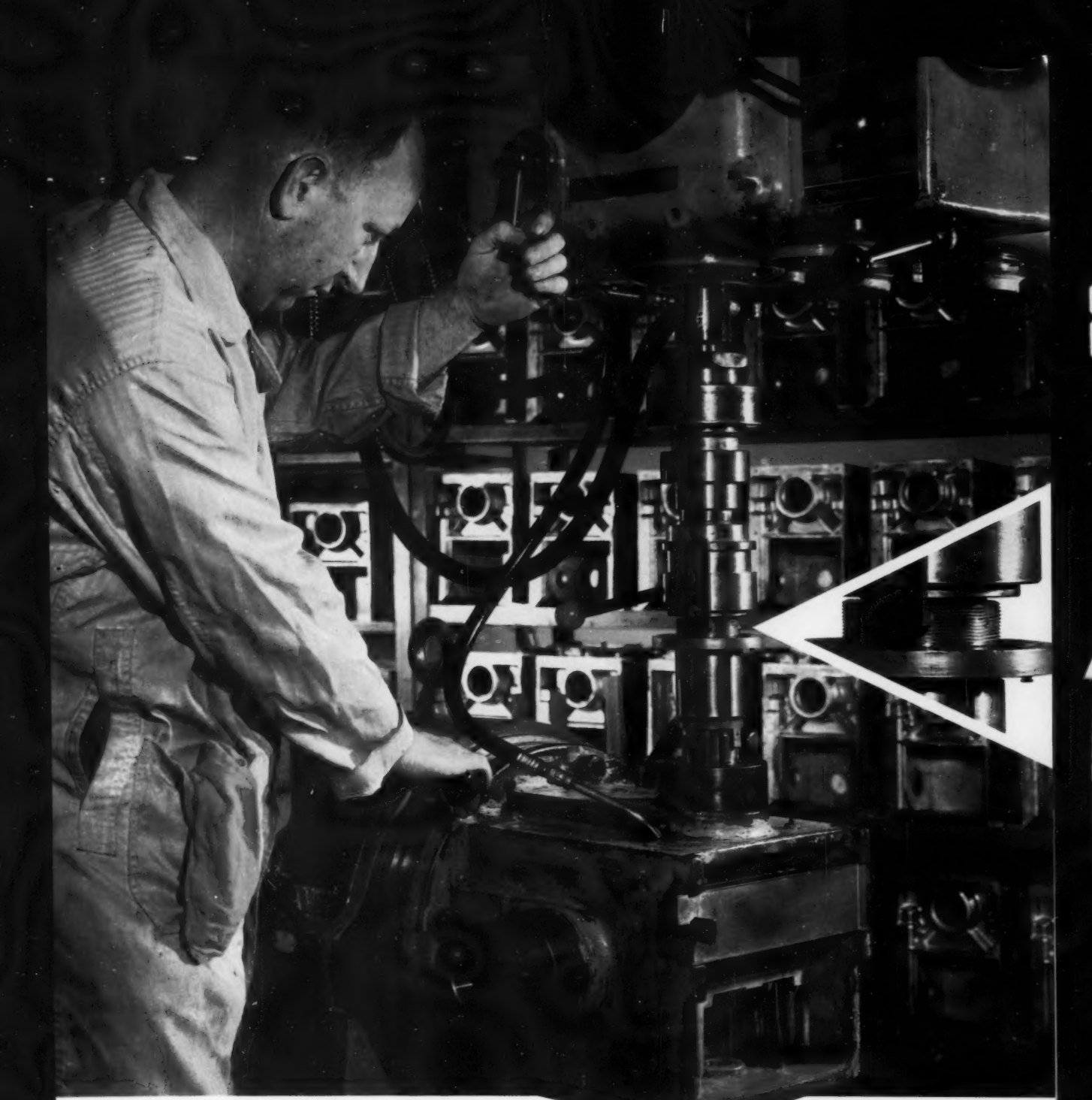
● **LOWEST PRICES** . . . The Clausing-Colchester is the biggest lathe value you can find anywhere! The 13″ straight bed model starts at $2302; 15″—$3221; 17″—$5070. Gap bed models are available in all three sizes. *Prices include 2-speed motor and American electricals.*

Get all the facts. Compare Clausing-Colchester with any other lathes of comparable size . . . feature for feature, dollar for dollar. Prove to yourself that Clausing-Colchesters are truly the "Greatest Values in Lathe History" . . . *the* lathes for *your* shop!

Write for Free Literature

CLAUSING COLCHESTER

CLAUSING DIVISION
ATLAS PRESS COMPANY
4-108 N. PITCHER ST. • KALAMAZOO, MICH.



BUILT-IN CONTROL Tapping 1-7/8-16 NS and 2-13/16-16 NS threads in die cast aluminum Drive Unit Housings presented a sticky problem at the North Wales, Pennsylvania, plant of Leeds and Northrup. The excessive weight of the tooling and machine spindle made hand feeding impractical and spoiled threads on many of these valuable units.

Leeds and Northrup engineers in cooperation with Geometric engineers designed two Geometric "S" Collapsing taps with built-in lead screw and follower, which resulted in positive control of the tapping operations, eliminated torn threads and speeded up the whole cycle.

Such special adaptations of regular tools are commonplace at GEOMETRIC. May we consult with you on your problem threading jobs?

GEOMETRIC-HORTON

NEW HAVEN 15, CONNECTICUT

Pick the one you need . . . there's a G-E Carboloy® toolholder for every metalcutting purpose

Designed to do a better job more efficiently, Carboloy toolholders help you get BETTER PROFITS THROUGH BETTER TOOLING

Even the very finest cemented carbide inserts (Carboloy carbides) can't do a decent machining job if the toolholder is inferior.

That's why the Metallurgical Products Department of General Electric has evolved a line of toolholders to do a superior job in every metalcutting operation. Carboloy toolholders get the mileage out of inserts . . . take the headaches out of machining.

Choose from: Lift-O-Matics, with self-raising chip-breaker clamp (positive rake, negative rake – 20 styles, 186 sizes total); Adjust-O-Breakers, with the chip-breaker versatility of *many* toolholders (negative rake – 10 styles, 30 sizes); Tracers (positive rake, negative rake – 8 styles, 19 sizes total); Heavy-duty (8 styles – 10 sizes).*

These, along with the complete line of Carboloy inserts, insert seats, convertible seats, and brazed tooling, are all designed to help you attain "BETTER PROFITS THROUGH BETTER TOOLING." Check with your Authorized Carboloy Distributor today. Or write: *Metallurgical Products Department of General Electric Company, 11147 E. 8 Mile Street, Detroit 32, Michigan.*

**Available through Canadian General Electric Company, Limited, Toronto, Ont., and through International General Electric Company Division, General Electric, International, New York, N.Y.*

CARBOLOY®
CEMENTED CARBIDES

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

LINE BORING

STUB BORING

COUNTERBORING

ANGULAR BORING

FACE MILLING

END MILLING

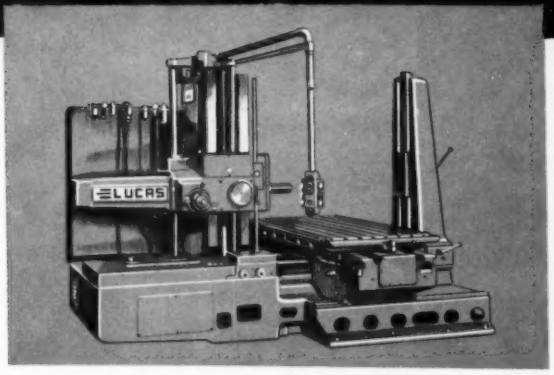
ANGULAR MILLING

DRILLING

REAMING

TAPPING

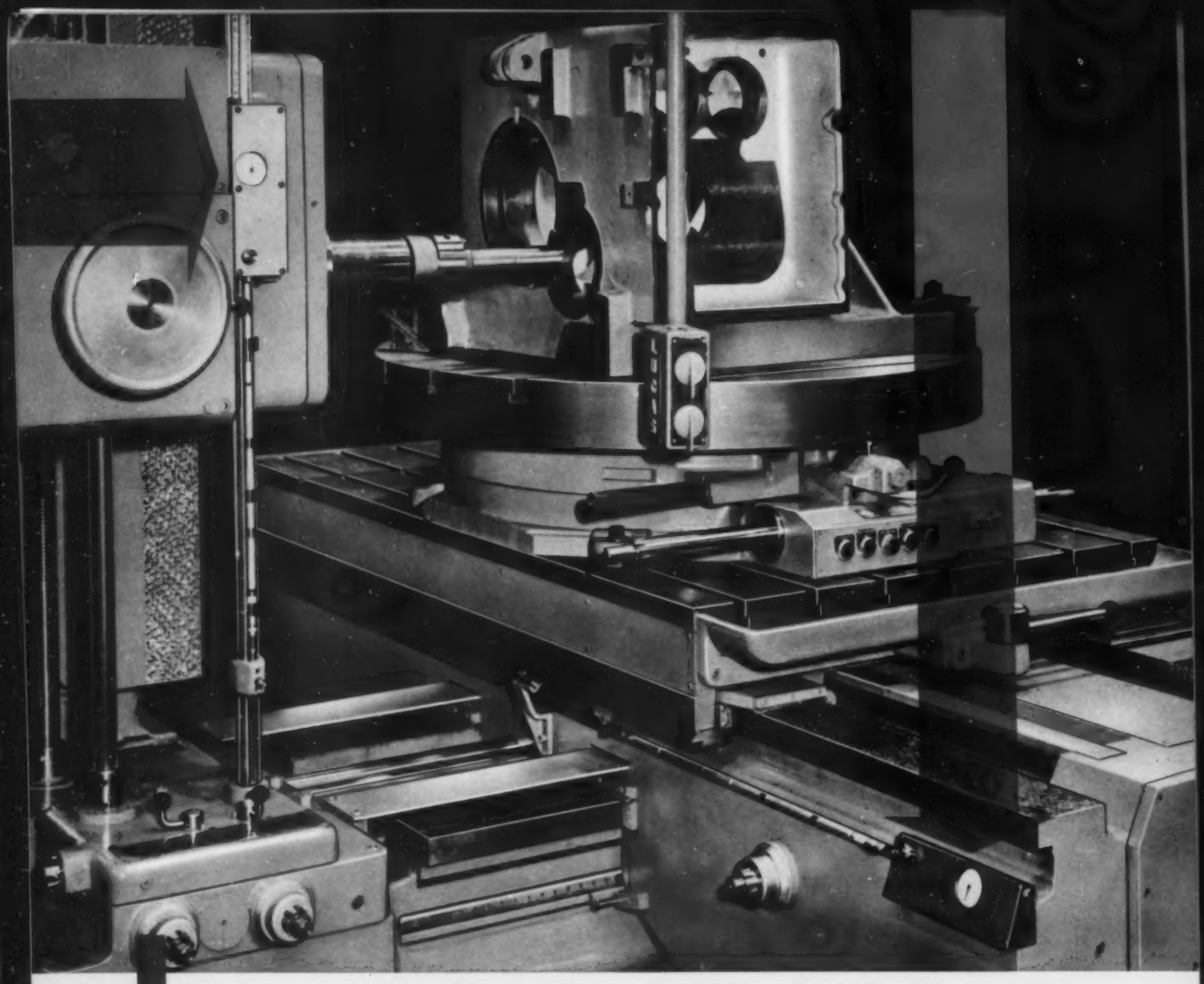
THREADING



Automatic power positioning with Lucas precision

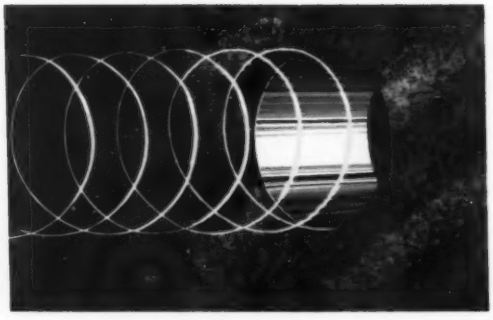
For production or faster completion of a single piece: locates head and table to predetermined settings for boring operations. No time wasted on jigs or fixtures in drilling, reaming and tapping. Lucas versatility, precision and time saving are the keys to Lucas profitability. Lucas Machine Division, The New Britain Machine Company, Cleveland, Ohio.

LUCAS
OF CLEVELAND



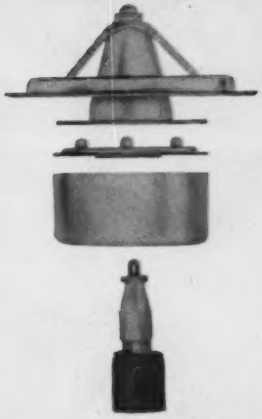
Automatic repeat settings accurate to ± .0001

Lucas Automatic Power Positioning operates at rapid traverse to locate head and table, entirely independent of operating feed rates—thru a system of end measuring rods and micrometer dial indicators. Upon starting the positioning cycle the machine does the precision setting automatically. Would you like a complete Lucas Catalog? Lucas Machine Division, The New Britain Machine Company, Cleveland, Ohio.



LUCAS
OF CLEVELAND

AGAIN-



EXPLODED VIEW OF AUTOSTAT® made by FULTON SYLPHON DIV., Robertshaw-Fulton Controls Co., shows impact extruded cup made from Revere Copper Rod. Other parts of this superior thermostat used in pressurized cooling systems in automobiles and other automotive equipment, are made of 70/30 Revere Brass Strip.

Revere helps "fit the metal to the job"

AND A LEADING MANUFACTURER OF AUTOMOTIVE THERMOSTATS IS ABLE TO PRODUCE A SUPERIOR PRODUCT FOR LESS MONEY

That little unimportant-looking copper cup shown above originally posed a king-sized production problem. It is a critical part of a newly designed automotive thermostat made by the Fulton Sylphon Division of the Robertshaw-Fulton Controls Co., Knoxville, Tenn.

In the early stages this copper cup was machined from free cutting copper rod, but this proved costly due to the high rate of scrap from the machining operation and the relatively high cost of turning out the machined part. At this point Revere Technical Advisors got together with Fulton Sylphon Engineers and the possibility of an impact extrusion was discussed. Revere T.A.'s in turn contacted suppliers who might furnish these extrusions in copper, to see whether or not they could be produced economically and to the demanding specifications required.

After exhaustive tests it was found that the cup could be impact extruded to meet the exacting hardness specifications of Fulton Sylphon. During its development, many problems involving temper, grain size and control of the chemical composition of the copper rod had to be solved.

In addition to the Copper Cup, Revere also supplies 70/30 Brass Strip from which other parts of the AUTOSTAT® are fabricated.

Said a Fulton Sylphon purchasing agent, "When you ask Revere for help you really get results."

This is still another case of how Revere, a supplier, working with still another supplier, was able to help its customer produce a superior product for less money. Why don't you take advantage of this service?

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue

New York 17, N. Y.

Mills: Rome, N. Y.; Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles, Riverside and Santa Ana, Calif.; New Bedford, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities, Distributors Everywhere.

HERE'S THE LATEST WORD ON COOLER GRINDING—

New COOLTEX by Texaco!

New Cooltex keeps machines cleaner, lets dirt and grit settle out faster. This means *freer, cooler grinding—without heat checks*—for smoother finishes. With Cooltex, wheels last longer, and you can even use a finer grit! Your Texaco Lube Engineer is sending out Cooltex reminder postcards. Watch for yours. Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

Tune In: Texaco Huntley-Brinkley Report, Monday through Friday—NBC-TV.

TEXACO

Throughout the United States
Canada • Latin America • West Africa

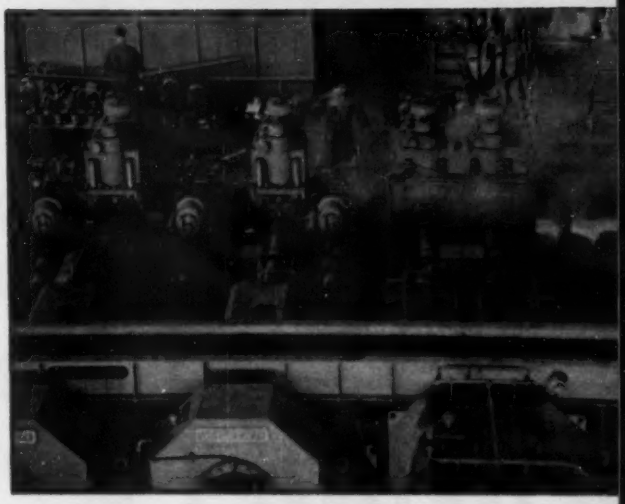
INNOCENTI

mechanical division

continuous mill

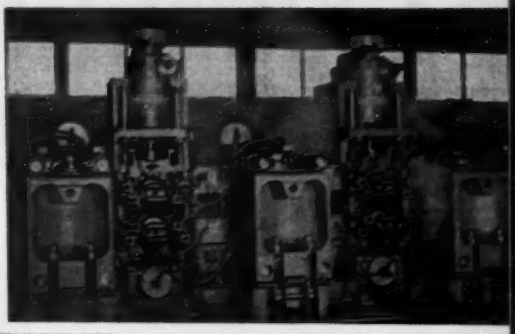
for the manufacture of seamless steel tubes and pipes

The Continuous Mill associated with the Stretch Reducing Mill in the double version for making tubes from $^{3}/_{8}$" to 3" and from $2.^{3}/_{8}$" to 7" successfully meets present requirements for consistently higher quality and quantity.

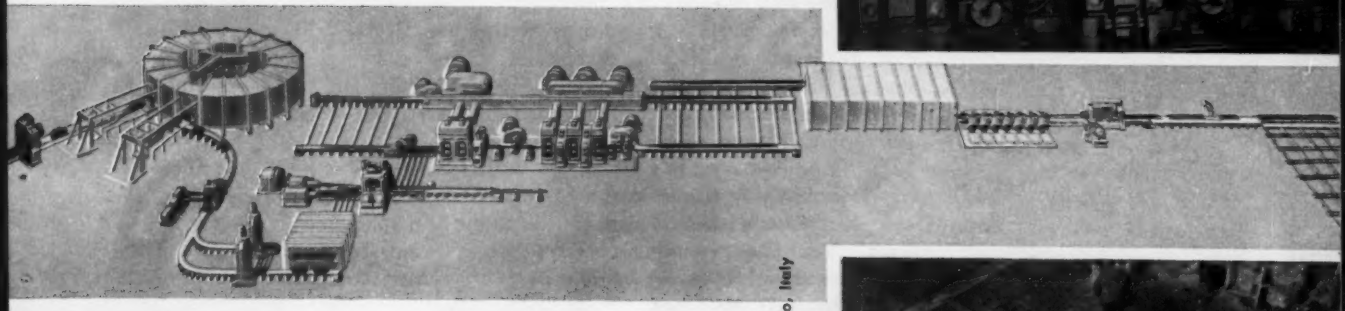


- Highest Capacity: the annual production can reach respectively 150,000 and 250,000 tons in the two versions.
- Highest yield: 93% - from billet to tube
- Complete automation: 1,5 man hour per produced ton
- Possibility to make tubes up to 18 mm with 2,25 mm minimum thickness without stretching
- Extremely easy to operate
- Low installation costs in respect of capacity.

These features make the Continuous Mill the most reliable tube making equipment for new installations or the modernization of the existing ones.



INNOCENTI



Continuous Mill in operation at DALMINE S.p.A. works in Costa Volpino, Italy

INNOCENTI

MILANO
Via Pilteri 81 - tel. 23-93
Head Office, offices and factory

ROMA
Via Parigi, 11 - tel. 487-051

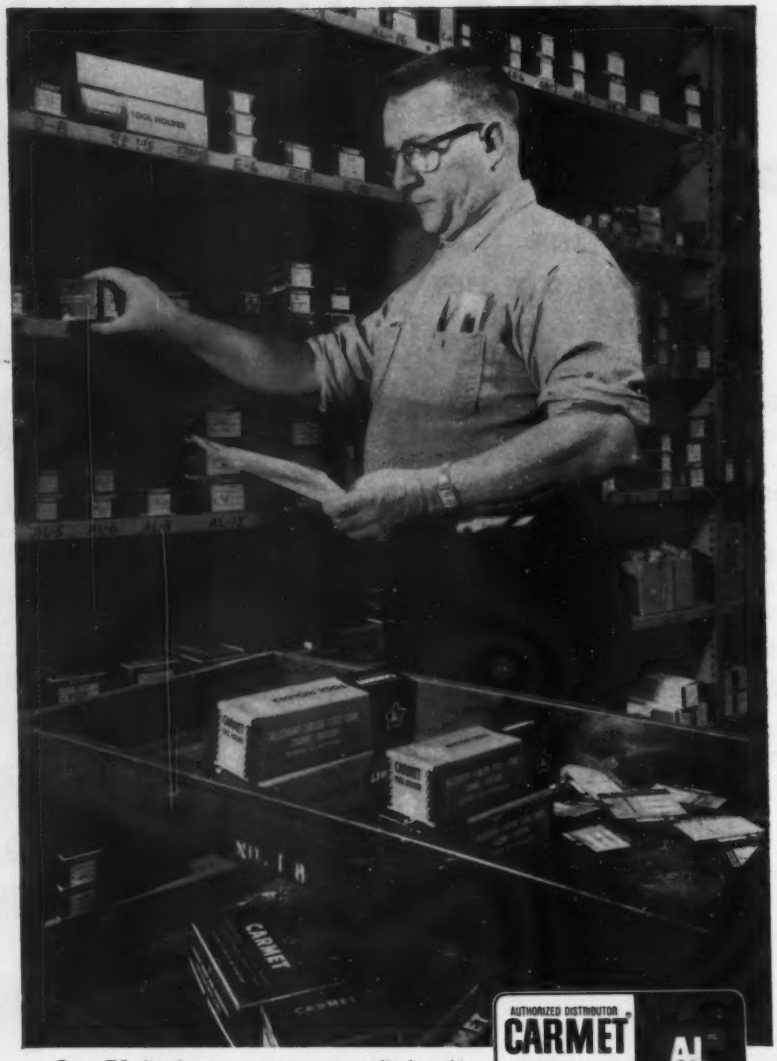
NEW YORK
INNOCENTI CORPORATION
43 West 61 Street N. Y. 23 - tel. Columbus 5-7795

PARIS
INNOCENTI
6, Av. F. Roosevelt - VIII tél. Balzac 03-51

LONDON
INNOCENTI U.K. Representative
Uganda House
58/59 Trafalgar Square. W.C. 2 tel. Whitehall. 2075

CARACAS
INNOCENTI Edif. Sudameris
Avenida Urdaneta y Fuerzas Armadas - tel. 845-461

Off-the-shelf delivery of Carmet® Carbide Tools from your local CARMET Distributor



Over 75 distributors, coast to coast, display this sign—service in your own local area.

Keep your inventory of Carmet Carbide Tools at a comfortable level. Keep your working capital free for other needs. Your Carmet distributor carries the load—that's how he's set up to do business.

He carries your needs from the complete line of Carmet Carbide Tools in all grades and every style. He is geared to deliver your orders quickly—a phone call gets action.

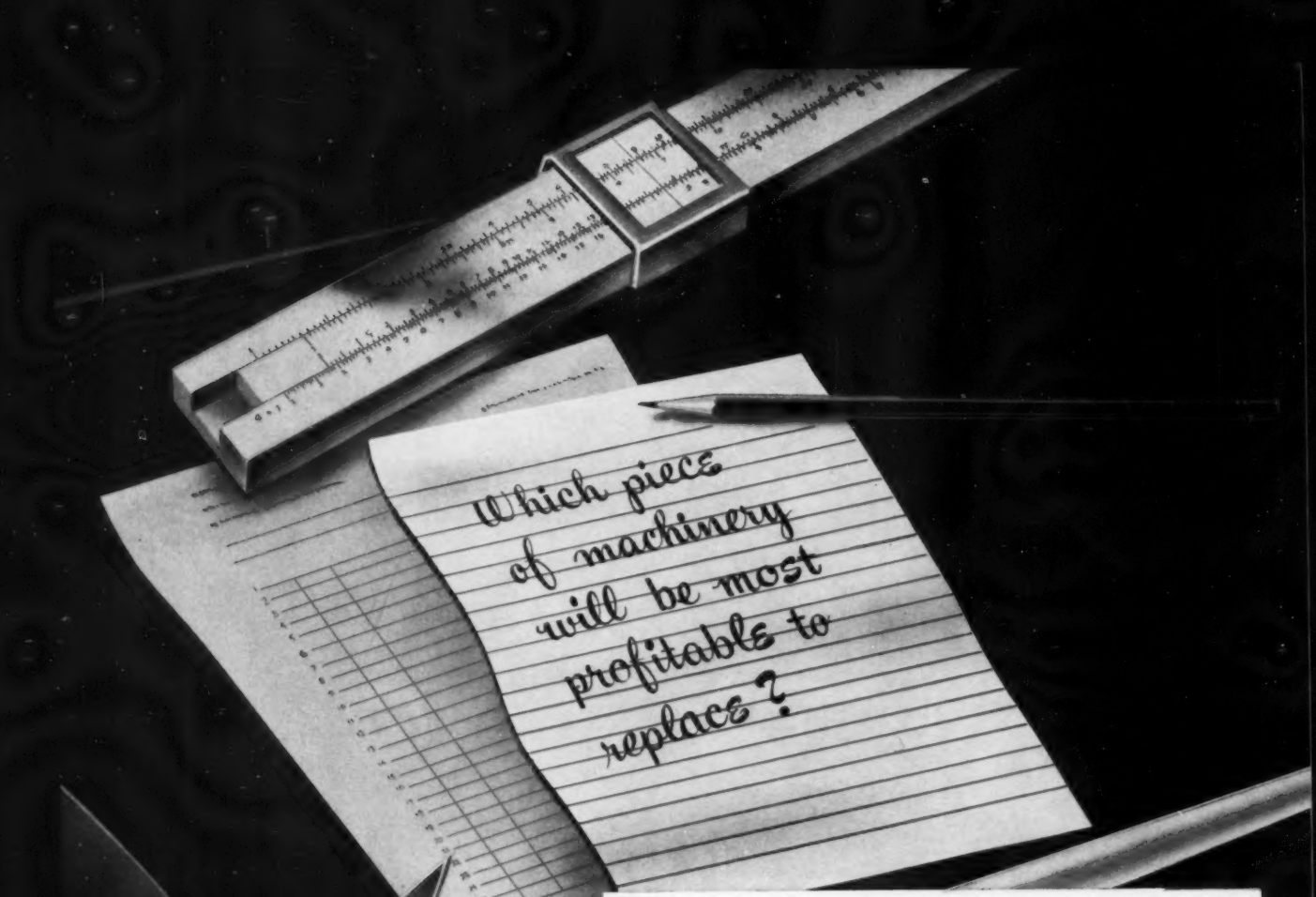
And if you get in a production jam, special service is his middle name. Remember, your Carmet distributor knows carbide tooling—with the help of the local Carmet technical man, you get all the help you need.

Your Carmet distributor handles the best Carbide Tools and backs it with the best service! ***Allegheny Ludlum Steel Corporation, Carmet Division, Ferndale, Detroit 20, Michigan.***

CARMET® AL

CEMENTED CARBIDE • DIVISION OF ALLEGHENY LUDLUM

1300



That's a good question. Not so many years ago, it was anybody's guess. At times machines were replaced through sheer necessity because they were allowed to run until they broke down completely.

Today management men with a keen eye on profits are going about machinery replacements with more scientific methods. They use formal machinery and equipment replacement programs that reveal the most profitable time to replace. They use formal work sheets which guide them into full and orderly consideration of all factors necessary to profitable replacements.

If *you* haven't looked into the possibilities of scientific machinery and equipment buying practices, we urge you to do so. The statements from other manufacturers give evidence to the fact that it is extremely worthwhile. Start it off by writing for this recently enlarged book. It explains what these other companies are doing and the results. For your copy, write to any one of the companies in this group.

Rockford Insert Group

Keep gathering metal-working production ideas . . . be well informed when you replace machinery . . .

April, 1960

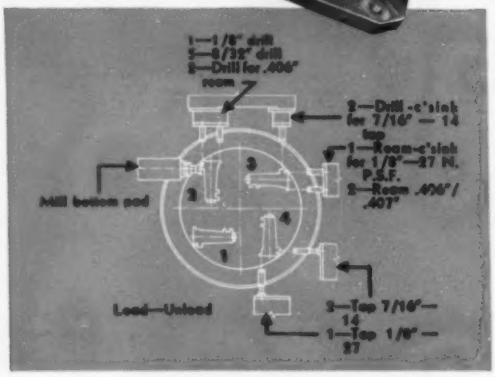
W. F. & JOHN BARNES

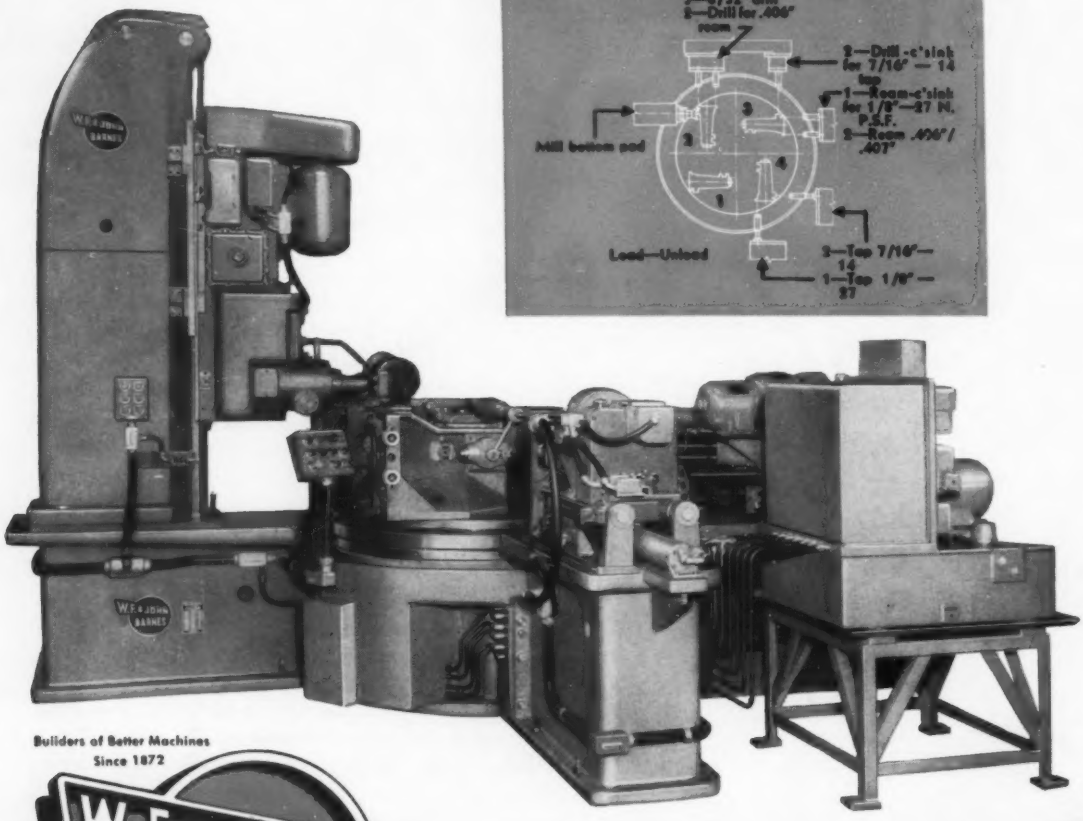
4 station special

HANDLES 17 MACHINING OPERATIONS, SAVES FLOOR SPACE

Here is another cost-cutting example of a special machine engineered by W. F. and John Barnes that provides both an efficient machining method and the means to save valuable floor space. A total of 17 operations on the cast aluminum transmission housing, illustrated at right, are performed at a gross production rate of 118 pieces per hour. Operator handles both loading and unloading while parts are processed at the three machining stations. A 48" diameter hydraulic table indexes the work from one station to another. Compactness of the machine's design conserves floor space, yet ample room is provided for easy accessibility to working heads.

Cast aluminum transmission housing





Builders of Better Machines Since 1872

W. F. & JOHN BARNES

ASK FOR AN ANALYSIS OF YOUR MACHINING METHODS — For assistance with machining problems ask a Barnes Engineer to work with you. Ask for a copy of "Coordinated Machine Engineering" — tells how Barnes 6-point machine building service saves time, eliminates divided responsibility.

W. F. & JOHN BARNES COMPANY

402 SOUTH WATER STREET • ROCKFORD, ILLINOIS

Multiple Spindle Drilling • Boring • Tapping Machines • Automatic Progress Thru Transfer-Type Machines

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

Grinding through hard scale at 7½ cubic inches per minute eliminates hidden costs

MATTISON HIGH-POWERED PRECISION GRINDING METHODS

Fig. 1—Tough outer scale and chilled edges on these hot-rolled steel bolster plates and eccentric straps made them costly to mill.

Fig. 2—Surface grinding not only reduced costs but improved finish and accuracy. Stock removal is between .040" and .060".

Grinding versus machining: Clearing's solution to cost problems

If you have flat surfaces to machine, particularly parts having tough outer scale or hard spots, there may be an idea here for you in the way Clearing Division of U. S. Industries, Inc., avoids unnecessary costs by grinding instead of milling.

The flat shape of these 1015 hot-rolled press parts (above) made them difficult to clamp on a milling machine, but the real problem was tough outer scale and burned edges. Cost of cutter replacement was high. Downtime and hidden costs for sharpening were the real reasons Clearing engineers switched from milling to high-powered surface grinding.

Fig. 3—Important machine features for high stock removal are: 60-hp spindle motor; rigid, heavy construction; outside coolant tank; and continuous downfeed.

Fig. 4—Setup costs were reduced because no clamping is required as with cutter-type machining.

A 60-hp spindle motor was specified to increase grain penetration and chip size. High downfeed and coarse, open-structure wheels produced the desired "self-sharping" action, and a high-detergent water soluble was used to keep wheels free-cutting. Rapid circulation of cutting fluid through Mattison's separate coolant tank eliminated any "heat barrier" under the spindle.

With quick-change segments and self-dressing action, downtime was virtually eliminated. The machine cuts through outer scale "like butter"—at the rate of 7½ cu. in. per min.

Surface grinding solved Clearing's cost problem and increased quality. Why not investigate this low-cost stock-removal method on your jobs?

New, Quick-Tilt Spindle

A new power-tilting device for Mattison No. 24 and 36 vertical-spindle rotaries permits you to combine the advantages of stock removal and precision grinding. A flick of the switch changes the spindle from tilted to perpendicular in seconds. With the help of this new feature, we are producing perfect diamond finishes and increasing production by as much as 50% on parts having large, uninterrupted surfaces. Ask your Mattison dealer to arrange for a demonstration or sample grind on your piece-parts in the Mattison Methods Laboratory.

MATTISON MACHINE WORKS
Rockford, Illinois Phone WOodland 2-5521

MATTISON MACHINE WORKS

HIGH-POWERED PRECISION SURFACE GRINDERS

CITY OF MACHINE-TOOL SPECIALISTS ROCKFORD, ILLINOIS, U.S.A.

REDUCE

. . . with Barber-Colman

You can't measure hob or cutter costs by purchase price alone. To find true cost, add time and labor on sharpening machines, plus losses incurred by improper sharpening.

Figuring them this way quickly proves that your best opportunity to save money is by doing a better sharpening job. Barber-Colman *automatic* sharpeners will do this for you, and reduce costs *four* ways:

1. *Tool depreciation cost*—Accurate index sharpening distributes wear evenly over all cutting teeth, avoids excessive stock removal to recondition tools. It permits you to maintain original accuracy and thereby reduce rejects. Fine finish, with wet grinding and our new automatic wheel dressers, reduces tool wear due to friction and chip welding. Result —you get a greater number of acceptable pieces for every dollar you spend on tools.

2. *Sharpening cost*—Have you given much thought to hidden costs like this? Sharpening is a major addition to tool cost, and one of the first places to look when your costs seem high.

Barber-Colman's new sharpeners feature automatic wheel dressing. They give you positive control over cost and quality. You never have to stop sharpening to dress a wheel because the machine *dresses as it sharpens.*

Variable table speed and stroke reduce both setup and sharpening times. One man easily can operate several machines and produce high-quality work. High cost of finger sharpening can be avoided with a method that is fast and accurate.

3. *Inspection cost*—Automatic sharpening reduces the need for inspecting each hob or cutter. Spot-checking to avoid setup mistakes is all you need to maintain quality.

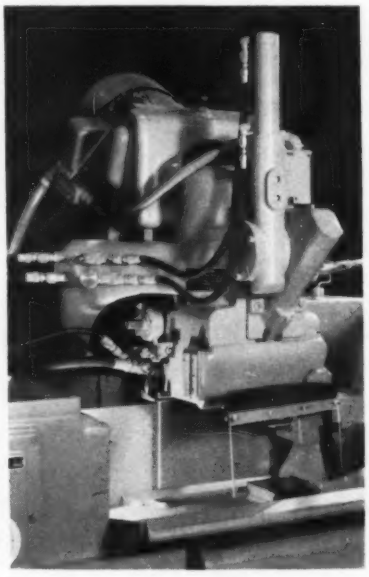
4. *Tool change cost*—Another major cost is downtime on your hobbing or milling machines to change tools. This can be minimized if improved sharpening will increase the number of pieces produced between grinds.

This sums up the approach by which you can make expensive cutting tools worth more to you today in terms of total cost per piece.

Automatic dressing key to improved sharpening

Almost everything you do on a hob or cutter sharpener can be improved by Barber-Colman's new automatic dresser — available on Nos. 4 - 8, 6 - 5, and 10 - 12 machines.

Your sharpening speed, accuracy, finish, wheel wear, and diamond life are controlled positively. The human element is removed from the fine art of dressing. Even spark-out is controlled automatically. This assures consistent accuracy, fine finish, and more work per man-hour. One operator easily can keep several machines busy because he is freed from the responsibility of attending the



CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.

TOOL COSTS

Automatic Sharpeners

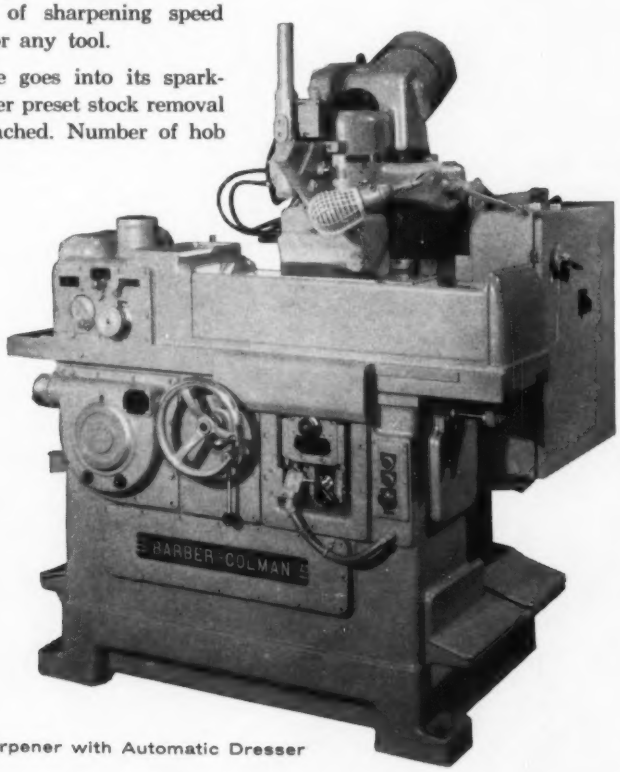
wheel. Loading and heat-checking are controlled for him. Here's how automatic dressing works:

The hydraulically actuated dresser arm operates continuously as the machine sharpens. The operator never stops the cut to dress a wheel. The wheel feeds into the diamond a predetermined amount before each dressing cycle. Amount of infeed and speed of the dresser arm control finish. Both are infinitely variable. This permits you to obtain the best combination of sharpening speed and finish for any tool.

The machine goes into its spark-out cycle after preset stock removal has been reached. Number of hob and cutter revolutions during spark-out also can be preset, thus providing a fully automatic operation.

New No. 4-8 sharpening machine speeds operation

If you are sharpening hobs, thread mills, or form cutters up to 4″ diameter by 4″ face width on old-style automatic sharpeners or cutter grinders, here is a machine that will cut costs *in half*.



No. 6-5 Sharpener with Automatic Dresser

The new Barber-Colman No. 4-8, with maximum table stroke of 10¾″, will sharpen two 4″ cutters simultaneously. It offers all of the latest advances in design, such as:

1. Automatic wheel dressing
2. Wet or dry grinding
3. Automatic spark-out
4. Quick-change arbors
5. Infinitely variable table speed and stroke
6. Rigid wheel head mounting

Call your Barber-Colman representative for assistance in setting up a sharpening program that reduces the *real* cost of hobs and form-relieved milling cutters.

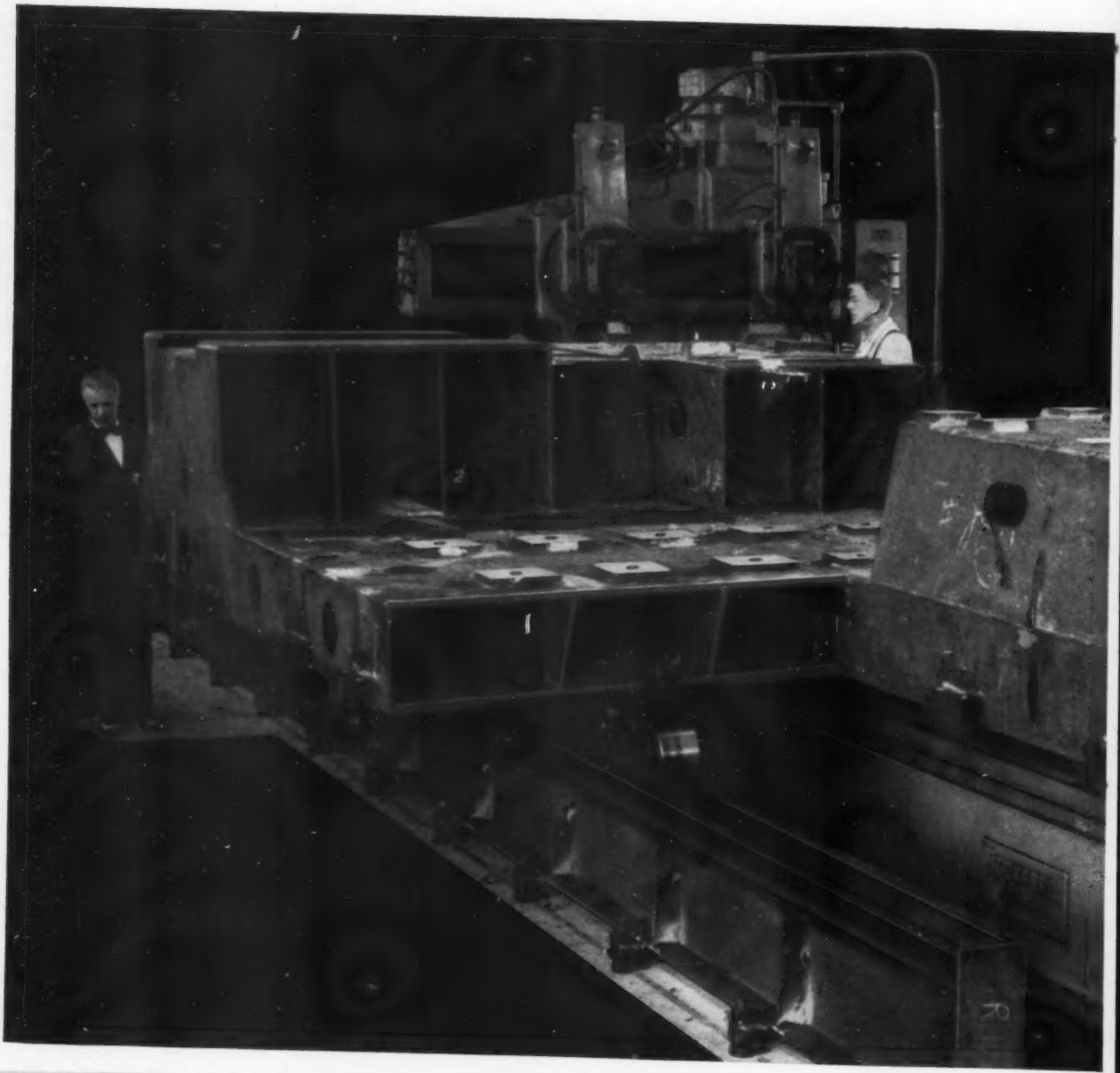
Barber-Colman Company

BARBER COLMAN

42 Loomis Street, Rockford, Illinois

FOR PRODUCTION MACHINE TOOLS IT'S ROCKFORD, ILLINOIS, U.S.A.

Nothing does the job like a...



MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.

ROCKFORD

... HYDRAULIC PLANER

POTTSTOWN MACHINE COMPANY MACHINES MORE WORK, AT LESS COST, THROUGH WIDE SET-UP FLEXIBILITY

SAVES 33% HOURLY COST, 15% TOTAL PRODUCTION TIME ON THIS JOB.

Operation: Using auxiliary rail, planes top and bottom pads on Paper Mill Drive base, 10′ 2½″ wide x 18′ 3¾″ long x 3′ 5¾″ high, weighing 8½ tons.

TOP: 26 pads, 6 different elevations; total area 2806 sq. in.

BOTTOM: 16 pads, one plane total area 3168 sq. in. largest pad, 12″ x 54″ smallest pad, 4″ x 9″

Total Set-Up: 40½ hours

Total Machining: 73¼ hours

Average Depth Cut: ⅜″

Nothing performs like hydraulic power:

- Infinitely adjustable feeds and speeds;
- Smooth, uniform cutting pressures for finer finishes;
- Maximum metal removal per HP expended;
- Low costs for machining, cutting tools and maintenance.

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

Pioneers In The Use of Hydraulic Power for Reciprocating Machine Tools

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

SUNDSTRAND "Engineered Production" METHODS

...practical ideas for men who are responsible for manufacturing quality, quantity, and profit

BROACHING

Wide range of straight and taper keys produced better and faster on a single Sundstrand-American broaching machine with universal fixture.

Over 25% production increase, better finish, and greater accuracy were achieved by installation of this Sundstrand-American horizontal broaching machine to replace equipment previously used.

Parts are keys ranging from ¼" to ⅝" wide, and from 1" to 6" in length in both straight and taper types. They are machined complete in one operation from bar stock. A single broaching tool is used for the complete range of parts produced. An easily adjustable universal fixture compensates for the length, width, and taper of the keys.

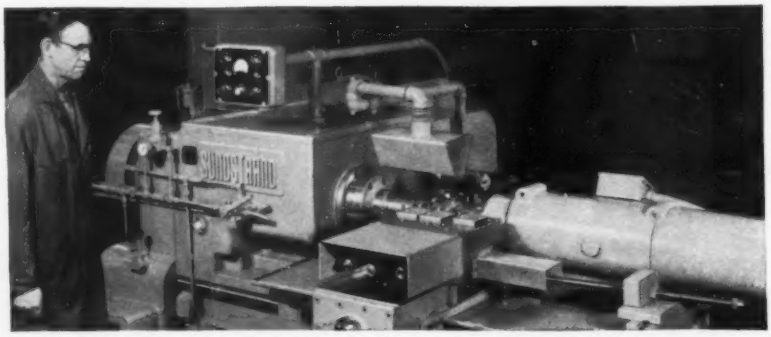
This basically standard machine with its special fixturing and tooling is a typical Sundstrand "Engineered Production" answer to a specific production machining requirement.

Because Sundstrand manufactures an extremely broad range of machine tools, including for example, broaching and milling machines, Sundstrand engineers have no fixations about the ideal method of performing the job. They approach each application with an open mind, a broad background of experience, and a wide range of "building-block" machines to draw from. This enables them to develop the best answer from the standpoint of production rate and cost, as well as the long-range economics of the machine — including future machining requirements.

For complete information on Sundstrand-American broaching machines, write for literature or, better yet, outline your specific requirements for preliminary recommendations on the machine to handle them.

AUTOMATIC TURNING

50% production increase achieved with multiple tooling on Sundstrand automatic lathe.



In nearly every shop, there are jobs on which the combination of automatic cycling and multiple tooling provided by Sundstrand automatic lathes will markedly reduce machining time and cost — for short as well as long runs. The machine cycles are so quickly changed over that setting up for a short run is entirely practical.

On the Model 12A machine illustrated, cylinder liners are turned, faced, grooved, and chamfered in just about half the time formerly required. This machine and its tooling are the result of a Sundstrand "Engineered Production" analysis wherein present and future work requirements were evaluated along with tooling requirements and cost.

Standard Sundstrand automatic lathes have been designed to provide maximum machining economy for an extremely wide range of operations. Where production volume warrants, Sundstrand recommends and builds semi-standard or special machines, as well as automatic work-handling devices and various standard or special attachments to exactly meet requirements.

For descriptive literature, write stating the size of lathe in which you are interested, or briefly describe the size and type of workpiece and machining requirements.

MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.

THREAD MILLING

Two operations performed simultaneously with one chucking on Sundstrand-Hanson-Whitney machine.

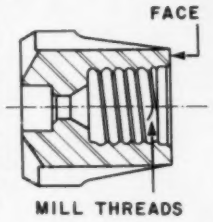
Cost of one complete machining operation has been eliminated by performing it simultaneously with another on this thread milling machine.

The part is a rock bit which must be accurately machined to seat properly on the drill "steel" which is used to drive it. The face (see illustration) must be square with pitch diameter of the thread within .003".

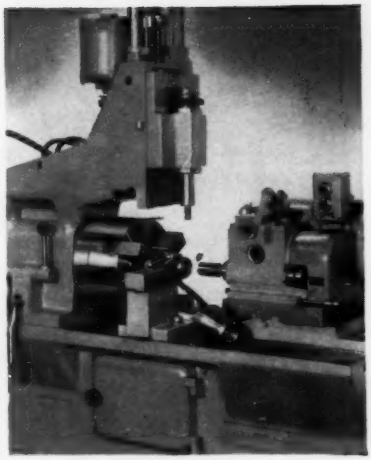
Milling of the thread is a standard operation. The addition of a vertical milling spindle provides simultaneous facing within the required tolerance limits. Production rate (100%) is 60 parts per hour.

The machine illustrated is typical of the complete line of Sundstrand Hanson-Whitney semi-automatic thread milling machines in sizes from 4 x 9" to 15 x 30", with bed lengths ranging from 33 to 84 inches. The advantages of thread milling are numerous, including:

- Will produce thread pitches too coarse for practical die cutting.
- Faster and more efficient than single-point cutter and conventional lathe, disc-type cutter and conventional thread miller, or conventional single-wheel grinding.
- Smoother and more accurate threads than usually obtainable with tap or die.
- Provides threads with pitch diameters bearing definite and accurate relationships to other elements of the workpiece.



These machines also permit convoluting of the first thread automatically, produce threads in locations impossible or impractical to reach through use of lathe, tap, or die, and hold tolerances on repetitive parts much easier than they can be held on a lathe.



For complete information, ask for Sundstrand Bulletin No. TM614.

ROTARY MILLING

Ruff and finish milling performed on single Sundstrand Rigidmil faster and more accurately than by previous method.

Many production milling problems can be simplified and improved through use of Sundstrand single or multiple vertical spindle rotary table Rigidmils.

The job illustrated is a good example. Various sizes and types of cast iron pillow blocks and housings are machined on the two-spindle machine shown, the first cutter performing the ruffing operation, and the second cutter the finishing operation. The rotary table design permits the operator to load and unload without interrupting continuous production.

Easily adjustable fixturing, an integral part of the machine, accommodates a wide range of parts which are produced at a rate of 80 to 240 per hour, depending on size and type.

Not only has production been increased over the previous method machining, but parts quality has been measurably improved through better finish and flatness. High accuracy is an integral function of the precision construction and rigidity of the machine and the Sundstrand-engineering fixturing.

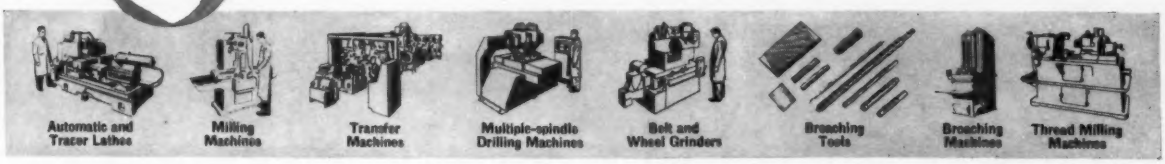
Sundstrand manufactures a complete line of standard rotary milling machines which can be provided with standard or magnetic chuck tables, as well as fixturing designed simplify holding and load and unload of virtually any type of part, regardless of irregularity.

For data and specifications, ask for Bulletin No. VR614.

SUNDSTRAND

SUNDSTRAND MACHINE TOOL

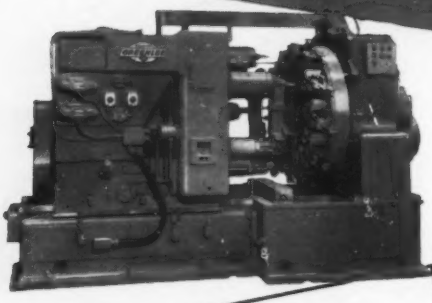
BELVIDERE, ILLINOIS • DIVISION OF SUNDSTRAND CORPORATION



FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

. . . an example of Automatic Production by Greenlee . . .

MMT-PE



97 cast iron oil pump bodies an hour

This Greenlee 12-station, horizontal indexing machine rough and finish machines cast iron oil-pump bodies for a leading auto producer at the rate of 97 pieces per hour. Indexing is fully automatic. Cycle time is 37.2 seconds. Tolerances of ± .001" for boring depth and ± .0005" for ream hole size are maintained.

STATION 1 — load, unload
STATION 2 — drill
STATION 3 — drill
STATION 4 — drill, chamfer
STATION 5 — rough bore
STATION 6 — rough ream
STATION 7 — rough bore
STATION 8 — semi-finish bore
STATION 9 — semi-finish bore
STATION 10 — finish ream, finish bore
STATION 11 — finish ream
STATION 12 — finish ream, finish bore

Let a Greenlee representative show you the modern Greenlee cooperative engineering approach to automatic production.

MACHINES DESIGNED WITH THE FUTURE IN MIND

PRODUCTION MACHINERY
GREENLEE

TRANSFER MACHINES
STANDARD AND SPECIAL MACHINE TOOLS

- Multiple-Spindle Drilling and Tapping Machines
- Six and Four-Spindle Automatic Bar Machines
- Die Casting Machines
- Trim Presses
- Woodworking Machines and Tools
- Hydraulic and Hand Tools

GREENLEE BROS. & CO.

1875 MASON AVE.
ROCKFORD, ILLINOIS

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

Soft Rubber Boots Prevent Injury to men or machines. A-B pendant stations are available with from 2 to 16 units, plus emergency stop unit in bottom of enclosure.

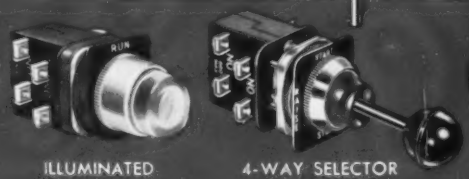
Allen-Bradley offers the

MOST COMPLETE LINE

of oiltight heavy-duty

CONTROL UNITS

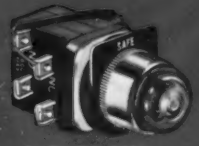
The wide selection of Allen-Bradley Bulletin 800T push buttons and control units will enable you to satisfy each and every control station requirement. A-B control units and stations have seals to exclude oils and cutting fluids—contacts cannot become fouled. And *all* control units have the popular A-B double break, silver contacts that assure reliable operation—without maintenance. The rugged construction, flexibility, and generous wiring room of Allen-Bradley's Bulletin 800T line are "bonus" features. To get the best in every way—insist on Allen-Bradley. Send for Publication 6090, today.



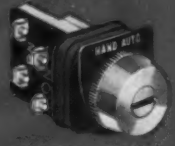
ILLUMINATED PUSH BUTTON
Space-saving two-in-one control unit.

4-WAY SELECTOR SWITCH
Can also be furnished for 2-way operation.

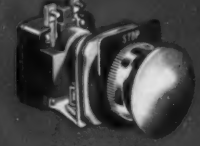
ENCAPSULATED PILOT LIGHT
Transformer type for rugged 6-volt bulb.



PUSH-TO-TEST
Six different color lenses available.



SELECTOR SWITCH
With coin slot operator. Other operators available.



TIME DELAY
Delay adjustable from 0.5 to 5 seconds.

POTENTIOMETER UNIT
Furnished in 2- or 5-watt capacity ratings.

LOCK TYPE
For selector switch or push button operation.

DOUBLE CIRCUIT
Has 2 N.O. or 2 N.C. sets of contacts.

16 UNIT STATION
in die-cast aluminum enclosure. Sheet metal cabinets also available for up to 25 control units.

ALLEN-BRADLEY

Member of NEMA

QUALITY MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

Yes, Allen-Bradley also makes...

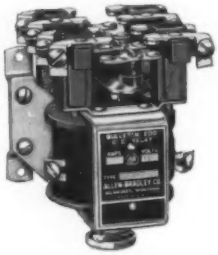
DC Contactors

Here's the only line of DC contactors using the simple solenoid design—with ONE moving part—in all ratings through Size 4. And their double break, silver alloy contacts never need servicing.

BULLETIN 202

DC Control Relays

These relays are the counterpart of the Bulletin 700 line of AC relays—of which millions are in service. With only ONE moving part—these relays provide the ultimate in long life and reliability. Like the AC line, they have double break, silver contacts that never need maintenance. Made in a variety of types and with up to 8 switching poles.



BULLETIN 200

Float Switches

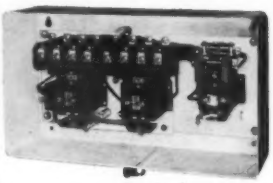
This versatile line of float switches is available in a wide range of types and enclosures to handle practically every industrial pumping job. They all feature a snap-action switch mechanism for positive operation no matter how slowly the liquid level changes.

BULLETIN 840

BULLETIN 1209

Loom Switch

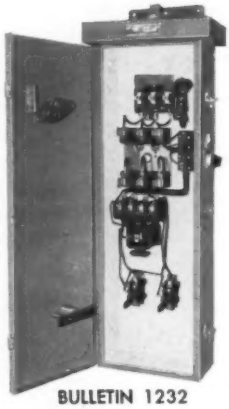
Manual starting switches designed for textile loom service. Design of operating lever makes accidental operation impossible. Lint-tight enclosure eliminates fire hazard.



BULLETIN 1270

Automatic Transfer Switches

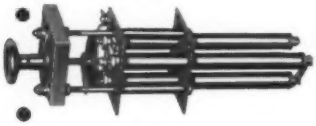
For use where power must be maintained, these panels automatically transfer the load to an auxiliary supply when normal supply fails or falls too low. Transfers automatically when the normal power supply is resumed. Mechanically interlocked.



BULLETIN 1232

Pump Control Panels

Designed for irrigation and oil field pumping applications. Can also be used with outdoor lighting systems. Uses standard A-B Bulletin 709 solenoid starter with manual disconnect switch or circuit breaker in weatherproof enclosure. Available with many optional features.



BULLETIN 410

AC and DC Rheostats

Provide absolutely stepless control over a wide resistance range. Full wattage capacity available at all settings. Sizes to 5400 watts.

6-60-RM

ALLEN-BRADLEY

Member of NEMA

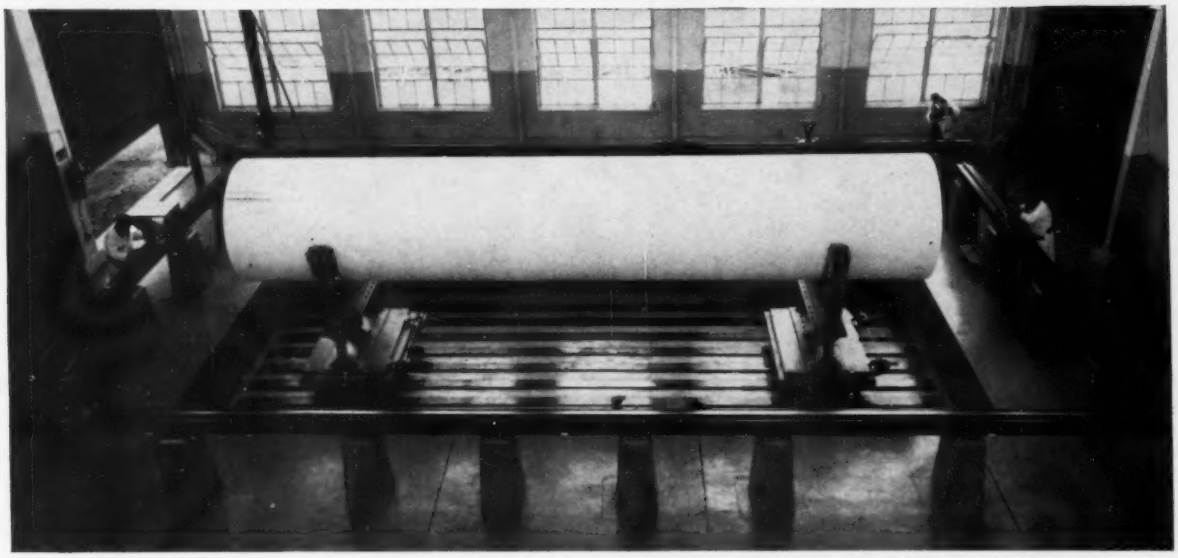
Quality **Motor Control**

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

BRUNSON OPTICAL TOOLING

Slashes Inspection Time UP TO 50%

IN VITAL MISSILE WORK FOR REYNOLDS METALS COMPANY



The close tolerance of ballistic shells demand great accuracy of measurement—a laborious, time-taking job with conventional equipment. Progressive Reynolds Metals Company, performing vital missile work has solved this problem with Brunson optical tooling equipment and the unique tooling dock shown above.

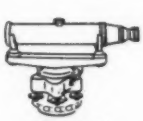
The tooling dock is a permanently located measuring device which completely surrounds the section being checked. Measurements are achieved by Brunson optical transits squares moving along calibrated rails parallel to fixed line of sights.

By means of this Brunson optical tooling set-up, Reynolds Metals is able to read dimensions to .001" accuracy, has slashed inspection time from 35 man-hours to 16 man-hours for certain missile sections.

Brunson optical tooling offers you the most efficient, convenient, and economical method yet developed to obtain the accuracy required for most of today's manufacturing operations—alignment of wheels, rolls and axles; resetting large workpieces; construction of jigs and mock-ups; and for all types of precision measurement. Outstanding in Brunson's advanced line of equipment is the exclusive self-proving optical transit square.

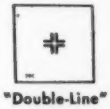
Look to Bruning for the *Complete* Line of Optical Tooling Equipment

Optical Transit Squares, Jig Transits



Alignment Telescopes

Horizontal and Vertical Tooling Bars



"Double-Line" Targets

This comprehensive 20-page booklet covers Brunson optical tooling—principles, applications, and equipment. It's a gold mine of information you would find difficult to obtain elsewhere. Yours free!

BRUNING **BRUNSON**

Charles Bruning Company, Inc., Dept. 4-WB
1800 Central Road, Mount Prospect, Illinois
Offices in Principal U. S. Cities
In Canada: 103 Church St., Toronto 1, Ont.

Please send me my free copy of the Bruning optical tooling booklet.

Name_____ Title_____

Company_____

Address_____

City_____ County_____ State_____

For more data circle this page number on card at back of book

Illustration of Malleable casting being turned at 1,400 surface feet per minute with a 0.100" depth of cut using an oxide tool.

Cut Machining Time and Costs... Use Malleable

It's the **finished** cost of machined components that's important to you. Remember then . . . Malleable iron is the most readily machinable of all ferrous metals of similar properties. With Malleable castings you'll reduce machining time as much as 50% . . . increase tool life up to 250% . . . get unexcelled surface finishes.

Find out how much you can cut **your** finished parts costs. Contact any nearby Malleable castings producer who displays this symbol—

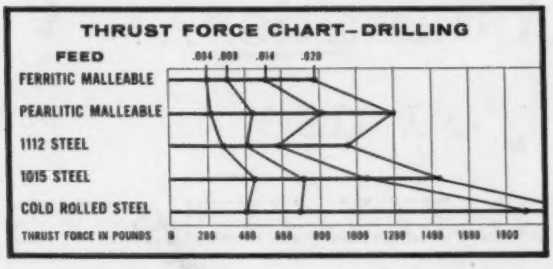
MEMBER
MALLEABLE
CASTINGS COUNCIL

For detailed information on "Machinability of Malleable Castings", contact any of the progressive companies listed on the opposite page, or Malleable Castings Council, Union Commerce Building, Cleveland 14, Ohio.

You'll Get Faster Machining...Better Finished Surfaces... Longer Tool Life with Malleable Castings

Whatever your machining goals—reduced cycle times, lower tool costs or better surface finishes, you will profit from remembering this fact: Malleable is the most machinable of all ferrous metals of comparable properties.

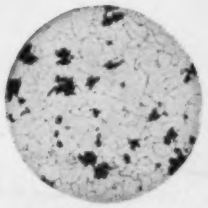
For example, compare the force required to drill Malleable with that required to drill other commonly used metals as we have done here—



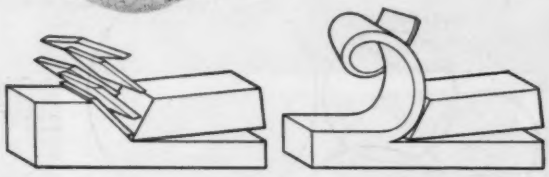
For this test we used ½ inch high speed steel twist drills with a suitable lubricant and a spindle speed of 715 RPM. AISI 1112 steel (Bessemer screw stock) was included because it is often used as a standard for machinability comparisons. Since machining may cost 2 to 4 times as much as the rough parts, the superior machinability of Malleable iron, as demonstrated here, can result in very large savings.

Chips Reveal the Secret of Malleable's Machinability

In addition to providing strength and ductility, Malleable's internal structure of microscopic carbon nodules allows Malleable to break easily into small chips as it is machined. This kind of Type I chip is highly desirable. Speeds and feeds can be increased . . . power consumption drops . . . cutting tools last longer. Malleable's uniform structure permits safe machining at maximum speeds.



Spherical carbon nodules (black) help break up chips. Photomicrograph 50X, etched.



Schematic drawing illustrates how Malleable (left) breaks into short, discontinuous Type I chips, rather than long, continuous Type II and III chips (right).

Future Promises New Triumphs for Malleable

With over two years' experience in advanced machining research, forward-looking Malleable castings producers already know how Malleable will perform when oxide cutting tools come into wide use. In experiments like the one illustrated on the opposite page it has been demonstrated that Malleable can be successfully machined at speeds as high as 1400 surface feet per minute and a 0.100" depth of cut! Surface finish, tool life and metallurgical structure are excellent . . . All this in a metal of rugged engineering properties.

Prove for yourself how much Malleable's machinability will do for your products . . . and your profits. Get in touch with one of the Malleable castings producers listed below. Call today.

Send for Free Machining Information — A special folder, *Data Unit 106, Machining Malleable Iron Castings*, is available from the Malleable Castings Council, Union Commerce Building, Cleveland 14, Ohio, or from any member company.

For Quality and Economy... Use MALLEABLE

For Service In Your Area Contact...

CONNECTICUT
Connecticut Mall. Castings Co., New Haven 6
Eastern Malleable Iron Co., Naugatuck
New Haven Malleable Iron Co., New Haven 4

DELAWARE
Eastern Malleable Iron Co., Wilmington 99

ILLINOIS
Central Fdry. Div., Gen. Motors, Danville
Chicago Malleable Castings Co., Chicago 43
Moline Malleable Iron Co., St. Charles
National Mall. and Steel Castings Co., Cicero 50
Peoria Malleable Castings Co., Peoria 1
Wagner Castings Company, Decatur

INDIANA
Albion Malleable Iron Company, Muncie Division, Muncie
Link-Belt Company, Indianapolis 6
National Mall. & Steel Castings Co., Indianapolis 22

IOWA
Iowa Malleable Iron Co., Fairfield

MASSACHUSETTS
Belcher Malleable Iron Co., Easton

MICHIGAN
Albion Malleable Iron Co., Albion
Auto Specialties Mfg. Co., Saint Joseph
Cadillac Malleable Iron Co., Cadillac
Central Fdry. Div., Gen. Motors, Saginaw

MINNESOTA
Northern Malleable Iron Co., St. Paul 6

MISSISSIPPI
Mississippi Malleable Iron Co., Meridian

NEW HAMPSHIRE
Laconia Malleable Iron Co., Laconia

NEW YORK
Acme Steel & Mall. Iron Works, Buffalo 7
Frazer & Jones Company Division Eastern Malleable Iron Co., Solvay
Oriskany Malleable Iron Co., Inc., Oriskany
Westmoreland Mall. Iron Co., Westmoreland

OHIO
American Malleable Castings Co., Marion
Central Fdry. Div., Gen. Motors, Defiance
Dayton Mall. Iron Co., Ironton Div., Ironton
Dayton Mall. Iron Co., Ohio Mall. Div., Columbus 16
Maumee Malleable Castings Co., Toledo 5
National Mall. and Steel Castings Co., Cleveland 6

PENNSYLVANIA
Buck Iron Company, Inc., Philadelphia 22
Erie Malleable Iron Co., Erie
Lancaster Malleable Castings Co., Lancaster
Lehigh Foundries Company, Easton
Meadville Malleable Iron Co., Meadville
Pennsylvania Malleable Iron Corp., Lancaster

TEXAS
Texas Foundries, Inc., Lufkin

WEST VIRGINIA
West Virginia Mall. Iron Co., Point Pleasant

WISCONSIN
Belle City Malleable Iron Co., Racine
Chain Belt Company, Milwaukee 1
Federal Malleable Company, Inc., West Allis 14
Kirsh Foundry Inc., Beaver Dam
Lakeside Malleable Castings Co., Racine
Milwaukee Malleable & Grey Iron Works, Milwaukee 46

For more data circle this page number on card at back of book

Even **holes** cost less in quantities... when you use U.S. DRILL HEADS!

That's because these Standard Adjustable U.S. Heads are designed and built for profit-making performance . . .

Positive all-gear drive . . . Shaved gears for smooth, quiet operation . . . High factor of safety in design . . . Anti-friction bearing mounting of shafts and spindles.

Ideally suited for high production with flexibility. And, they're DOUBLE DUTY TOOLS! When your drilling machine has a reversing spindle, you can drill and tap the same hole pattern with one head.

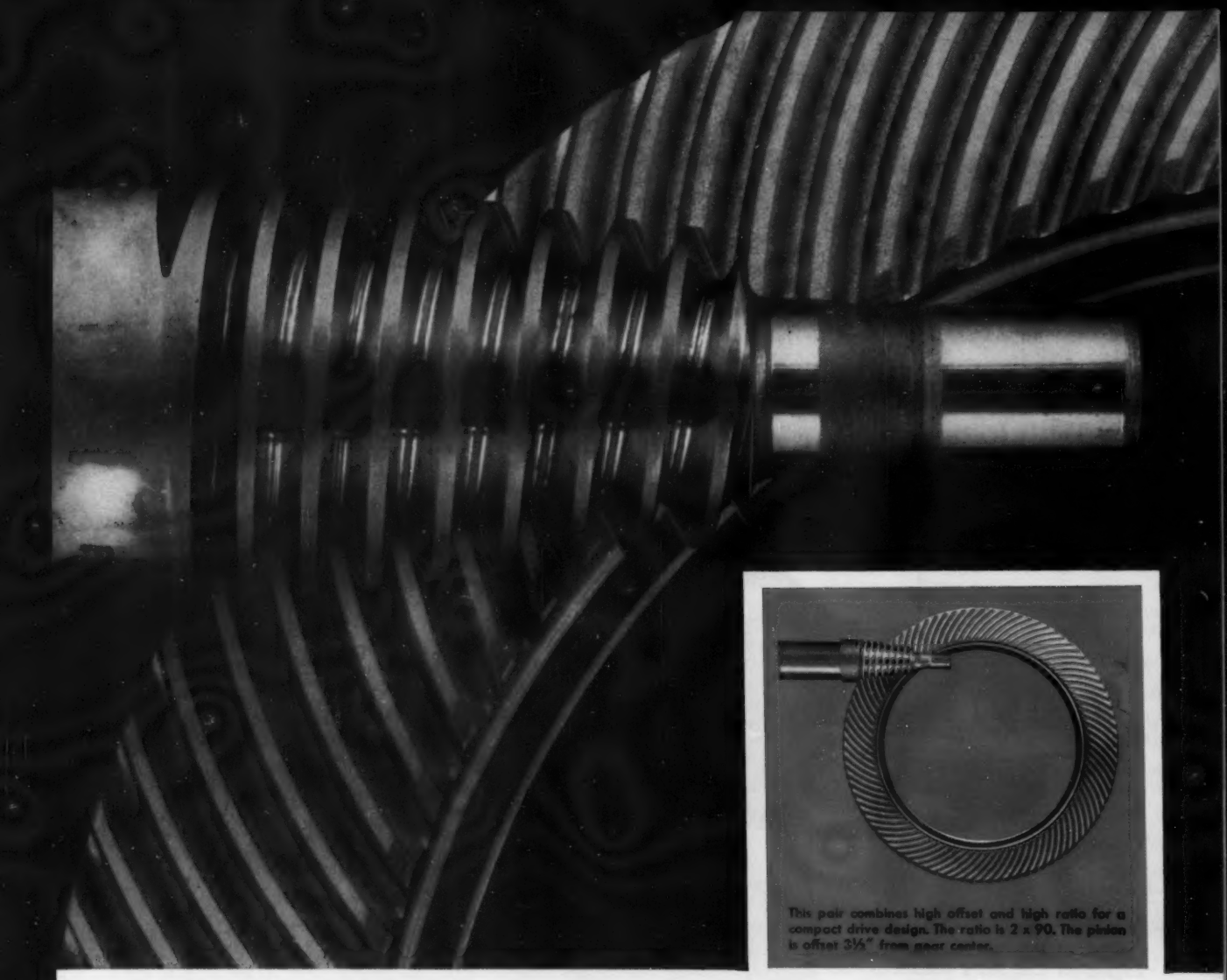
Write for Catalog AD-57 covering the COMPLETE LINE of Standard and Universal Adjustable U.S. Drill Heads. Or, send specifications of your particular requirements. No obligation, of course.

US DRILL HEAD

Adjustable and Fixed Center Multiple Drilling Heads.
Individual Lead Screw Multiple Tapping Heads.

UNITED STATES DRILL HEAD CO.

BURNS STREET • CINCINNATI 4, OHIO



This pair combines high offset and high ratio for a compact drive design. The ratio is 2 x 90. The pinion is offset 3½" from gear center.

See how the teeth "wrap around" this high-reduction pinion

This is a high-ratio hypoid gear. In principle, it is not different from more conventional hypoids produced by the Gleason Works. *But . . .*

If you look closely at the pinion, you'll notice that the teeth tend to "wrap around" it. This design is extremely well suited for high reduction, strength and compact design.

The result is a conical (or sometimes cylindrical) pinion which permits *continuous tooth action—even with just one or two teeth!* Compared to corresponding bevel pinions, its diameter is greater for higher strength. An extended shank on cylindrical pinions makes *very rigid* straddle mountings practical.

You can design a *compact* unit, because high offset is possible! For high-offset *or* high-ratio pairs, the "wrap around" tooth design provides an extra measure of the smooth, quiet tooth action of hypoid gears.

High-ratio hypoids can be cut on the same Gleason equipment that is used on more familiar spiral bevel gears and hypoids. You can also use the same testers, quenching presses and other auxiliary Gleason equipment you're using now. Grinders are available for applications requiring precision finish.

High-ratio hypoids can be produced by the Gleason Works for ratios of 1:10 or 1:40 or even higher. They are finding a growing number of applications in such diverse fields as farm machinery, instrumentation and office equipment.

You can get more information about Gleason high-ratio hypoid gears by writing for free literature. Submit your prints for recommendations.

GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

Modern machine tools equipped with VICKERS® hydraulics produce the new inclined engine for Chrysler's Valiant

Machine tools of the most modern design are required to produce the new inclined six-cylinder engine for Chrysler's Valiant in volume and to the required precision standards. A walk through the Trenton, Michigan, engine plant quickly establishes the fact that the majority of hydraulically operated machine tools are equipped with Vickers hydraulics. (See tabulation at right.)

Machine builders and users have long been aware that performance goes up and maintenance decreases when Vickers hydraulics are specified. *One* reason is that each Vickers pump, motor, and control element represents advanced hydraulic design and manufacture. *Second*, unmatched application engineering experience is applied to planning the installation. *Finally*, service wherever necessary is promptly provided by technicians who are Vickers hydraulic specialists. More details are available about specific products and services in the *all new* Catalog 5001.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Machinery Hydraulics Division
DETROIT 32, MICHIGAN

8537

These machine builders use Vickers hydraulics

Apex Corporation
Barnes Drill Co.
Bilt-Rite Tool Co.
Buhr Machine Tool Co.
Century Spray Corp.
Cleveland Hobbing Machine
Colonial Broach & Mach. Co.
The Cross Company
Ex-Cell-O Corp.
Fitchburg Engineering Corp.
The Foote-Burt Co.
Gisholt Machine Co.
Greenlee Bros. & Co.
Heald Machine Co.
Industrial Metal Products Corp.
The Ingersoll Milling Mach. Co.
F. Joseph Lamb Co.
Landis Tool Co.
The LaPointe Machine Tool Co.
LaSalle Machine Tool, Inc.
The R. K. LeBlond Mach. Tool Co.
Leland Detroit Mfg. Co.
Michigan Special Machine Co.
Micromatic Hone Corp.
The Motch & Merryweather Machine Co.
National Acme Co.
National Automatic Tool Co., Inc.
Norton Company
Sheffield Corp.
Snyder Corp.
Starr-Kop Engineering Co.
Sundstrand Machine Tool Div. Sundstrand Corp.
Jarvis B. Webb Co.
Wickes Corp.
Wilson Automation Co.
Wilson Engineering, Inc.

VISIT US IN BOOTH 1725 AT THE DESIGN ENGINEERING SHOW
NEW YORK COLISEUM, MAY 23-26

NEW INDEXING AUTOMATIC COMBINES MANY OPERATIONS ON LARGE WORK PIECE

This 40-inch Kingsbury machine omits center column, costs less

Center columns are used on most indexing machines for large work or many operations. But for some of these setups we can use this new machine with a 40-inch index table that costs less than machines with center columns.

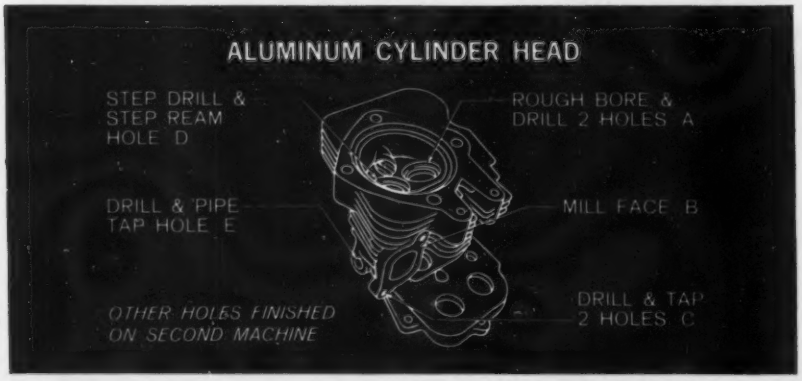
From six to twelve stations are available, but double indexing makes three to five stations possible. The mechanism that indexes and locks the table is similar in design to that used in our center column machines.

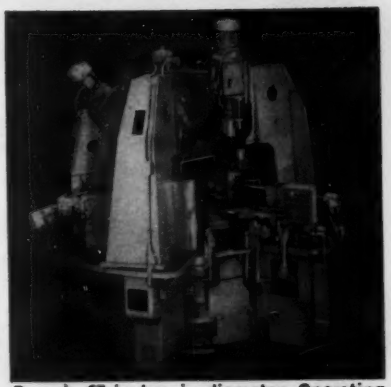
The machine shown here operates on aluminum cylinder heads. The work is tipped in each fixture so that the vertical units on columns operate on the two holes A. Behind the left column is a milling unit for the intake manifold face B. The operating unit is mounted horizontally 45° left of the radial center line through the station, and the milling head is 17° off the vertical.

At the back of the machine are two units that work downhill at a 53° angle on hole D. Below them are two units that operate uphill at a 17° angle on two holes C. Finally at the right are two horizontal units for hole E, each mounted 45° left of the radial center line.

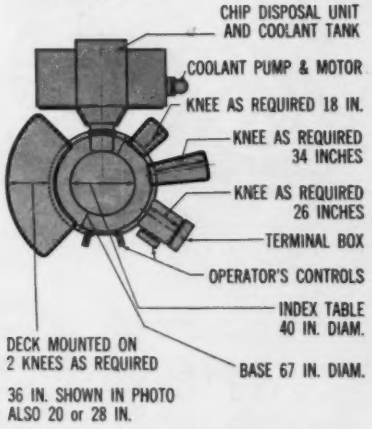
We build simple machines, too

Every machine has good basic design and accurate rugged construction. These machines pay off by operating with minimum trouble for years. If you have a job for a multi-unit automatic, we want to talk specifics with you. How about it? Kingsbury Machine Tool Corp., Keene, New Hampshire.


ALUMINUM CYLINDER HEAD
STEP DRILL & STEP REAM HOLE D
ROUGH BORE & DRILL 2 HOLES A
DRILL & PIPE TAP HOLE E
MILL FACE B
OTHER HOLES FINISHED ON SECOND MACHINE
DRILL & TAP 2 HOLES C



Base is 67 inches in diameter. Operating units are mounted on knees 18, 26 or 34 inches deep as needed, or on decks that in turn are mounted on two knees per deck. Index drive unit is inside base and has a 1 HP 1750 RPM motor.


CHIP DISPOSAL UNIT AND COOLANT TANK
COOLANT PUMP & MOTOR
KNEE AS REQUIRED 18 IN.
KNEE AS REQUIRED 34 INCHES
KNEE AS REQUIRED 26 INCHES
TERMINAL BOX
OPERATOR'S CONTROLS
INDEX TABLE 40 IN. DIAM.
DECK MOUNTED ON 2 KNEES AS REQUIRED
BASE 67 IN. DIAM.
36 IN. SHOWN IN PHOTO ALSO 20 or 28 IN.

(Below) Nine units operate from five directions at gross rate of 150 parts per hour. Index table holds five work fixtures with power clamping and unclamping.

WHEN YOUR SPECIFICATIONS CALL FOR THE *FINEST* IN CAMS...

For over half-a-century Rowbottom has been producing cams for America's industrial needs. Servicing blue chip giants and small companies alike, we act for many customers as a virtual "cam department," staffed with experts familiar with every type of cam requirement.

Whatever your cam needs — box, barrel, face or index — we can do the job to your specs. In addition to milling, we harden and grind *any material or analysis.* Our cam capacity ranges in size from one inch to a mammoth six feet!

We also manufacture Cam Millers, Cam Grinders and Rotary Profilers. Complete details available upon request.

THE ROWBOTTOM MACHINE COMPANY

SHEFFIELD STREET • WATERBURY • CONNECTICUT

SOLD THROUGH INDUSTRIAL DISTRIBUTORS

Cushman Air Operated Chucking Equipment reduces chucking and unchucking time from minutes to seconds and increases machining output accordingly. Cushman Air Operated Chucking Equipment provides instant, positive work piece gripping . . . any tendency towards slippage causes air pressure follow-up to exert more jaw pressure. With full control of jaw pressure for the material being machined, Cushman Air Chucking virtually eliminates operator fatigue and related rejects as well as decreasing floor-to-floor time and improving machining accuracy and efficiency.

Write now for Bulletin No. PO-66D and see how Cushman Air Chucking Equipment installed on either new or old equipment can save you time and money at an investment which will quickly pay for itself.

*'60

BOOTH 1021

the grip never slips

CUSHMAN

AIR OPERATED CHUCKING

THE CUSHMAN CHUCK COMPANY • HARTFORD 2, CONNECTICUT

CUSHMAN CHUCKS . . . A PRODUCT OF AMERICAN QUALITY, LABOR AND MATERIALS

MANUFACTURERS OF CUSHMAN POWER WRENCHES, MANUALLY OPERATED CHUCKS and FACE PLATE JAWS

3C560

A SERIES OF EDLUND CAM FEED UNIT MACHINES AT RAYTHEON PLANT.

EASY OPERATION FROM A SIMPLE PUSH BUTTON CONTROL STATION.

EDLUND CAM FEED UNITS SELECTED BY RAYTHEON FOR SPECIALIZED DRILLING

EDLUND CAM FEED UNIT MACHINES are designed to individual order. At RAYTHEON'S Missile Systems Division Plant, Andover, Mass., they are used on parts for the Hawk Missile. By utilizing specially constructed multiple heads with angular spindles—a New concept in this type of work—these machines accomplish difficult drilling, reaming, tapping, spot facing, and countersinking operations. Operating in any position, the units can be used in single or combination batteries. The infinite adaptations of EDLUND CAM FEED UNIT MACHINES pay off in faster production and reduced drilling costs.

Send for Free Illustrated Bulletin

Edlund Representatives in Major Cities

EDLUND CAM FEED UNIT MACHINES FEATURE:.

1. The Advantages of Positive Cam Feed.
2. One Man Operation— by Electric Control.
3. Speeds from 310 to 3800 rpm., and Maximum Cam Strokes of 2½" (No. 62) and 3" (No. 125).
4. Adaptable to Angular Drilling Operations.
5. Simple Jig Set-up gives Precision Operation.
6. Numerous Drilling Operations can be Performed Simultaneously.

MMT-PE — Modern Machine Tools — Production Efficiency

EDLUND MACHINERY COMPANY, Cortland, New York

Division of Harsco Corporation

EDLUND CAM FEED UNIT MACHINES DOING INTRICATE DRILLING DURING THE MANUFACTURE OF HAWK MISSILES.

EDLUND CAM FEED UNIT MACHINES— ENGINEERED TO SOLVE YOUR SPECIALIZED DRILLING PROBLEMS

FOR PRECISION DRILLING AT RAYTHEON IT'S THE EDLUND MODEL 2G VERTICAL GUN DRILL

RAYTHEON'S MISSILE SYSTEMS PLANT, ANDOVER, MASS. USES THE EDLUND MODEL 2G GUN DRILL FOR ACCURATE EFFICIENT DRILLING IN HARD TO WORK METALS.

When your company, like RAYTHEON'S Missile Systems Division Plant, Andover, Mass., requires drilling with extremely close tolerances and precise accuracy, the EDLUND MODEL 2G VERTICAL GUN DRILL is the answer. This machine can cut cost and speed work with the elimination of secondary operations. The EDLUND MODEL 2G VERTICAL GUN DRILL offers precision drilling of odd shaped parts. It is ideal for firms doing intricate work in aircraft, missiles, electronics, or other specialized fields.

The EDLUND MODEL 2G VERTICAL GUN DRILL Offers These Features:

1. The Most Economical Gun Drilling Machine on The Market
2. TRUE Holes with a FINE Finish—2 to 32 Micro Inches
3. Accurate Drilling of ALL Types of Material
4. This Machine Offers Features to Utilize The Full Potential of the Modern Rotating Carbide Gun Drill. ***Send for Free Illustrated Bulletin 2G***

EASY DRILLING OF THOSE DIFFICULT PROBLEM HOLES.
COMPLICATED PARTS EASILY DRILLED WITH EDLUND GUN DRILLING MACHINE
.125" Diameter Holes—5½" Deep Size within .003" Straightness within .002"

EDLUND REPRESENTATIVES IN MAJOR CITIES

EDLUND

MACHINERY COMPANY, Cortland, New York

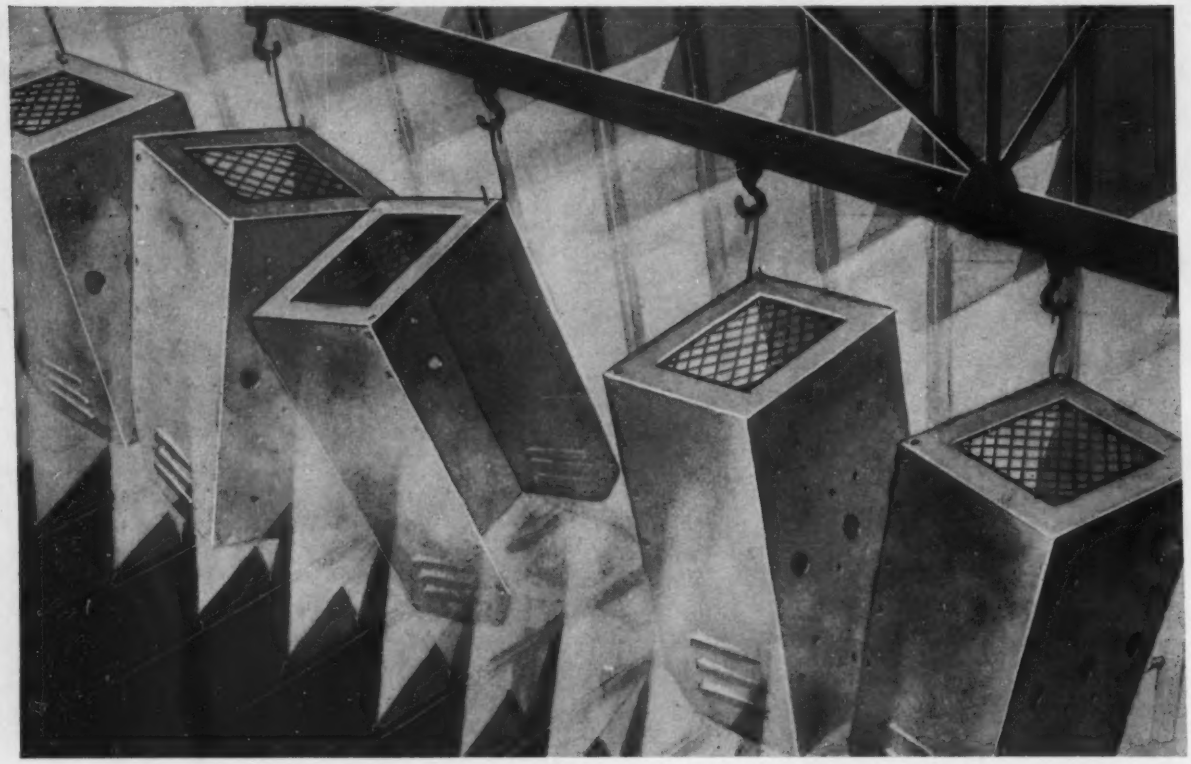
Division of Harsco Corporation

MODERN MACHINE TOOLS MMT=PE PRODUCTION EFFICIENCY

For tough steel cleaning jobs

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 FIELD SERVICE MEN • OVER 160 MATERIALS



New acid cleaner Oakite 86 gives fast smut removal . . . good paint grip

Shop smuts on steel parts disappear fast with Oakite 86 in the washing machine. A superior acid detergent, it removes all kinds of soils efficiently—really goes to work on heavily smutted steel. In addition, it forms a conversion coating on steel surfaces to give a good grip on subsequent paint coats . . . helps inhibit corrosion.

Oakite 86 also works well when aluminum, zinc, brass and terneplate pass through the washer.

And it is just the latest in a complete line of Oakite materials for spray washing machines. Others include products for high-pressure spraying, for rapid cleaning, for heavy-duty cleaning, for low-heat cleaning, for conversion coatings. Ask the Oakite man which one will work best with your machines, your metals, your specific jobs. Or, write for FREE bulletin. Oakite Products, Inc., 26 Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

over 50 Est. 1909 SCIENCE years' leadership in industrial cleaning

MACKLIN
MACKLIN
MACKLIN

In cylindrical grinding, too, for production, precision, and economy..

MACKLIN

YOU CAN DEPEND ON MACKLIN "Wheels of Profit"

Whatever cylindrical grinding method you use, traverse, plunge cut, or form, MACKLIN cylindrical wheels finish straight or tapered pieces to exact size and close tolerance.

Macklin cylindrical "wheels of profit" give you built-in wheel uniformity . . . precise wheel balance . . . good cornering ability . . . free and cool cutting . . . and longer wheel life.

Here's Proof of Performance

CARBON STEEL—"Extremely fast cutting on crankshaft pin bearings and still holds the radius. Highest production ever experienced." 29A462 04 V15.

ROLLS—"Rapid stock removal on roughing passes and still produces required finish easily without chatter on forged steel reduction mill rolls." A70 L II B2.

For complete information, send for Bulletin CLY.

MACKLIN

GRINDING WHEELS

MACKLIN company Dept. 14, Jackson, Michigan

MACKLIN

46% gain in production with BAKER®

ADJUSTABLE SPINDLE MACHINE

Standard Baker Vertical Adjustable Spindle Drilling Machine.

Cutting production time on an individual part from 6 minutes to 2 minutes, 47 seconds is typical of the production efficiency delivered by a new BAKER drilling machine at a leading manufacturer of power transmission equipment.

The average overall production increase is 46%.

It's flexible, too. Altogether 35 different parts are run across it.

For extra economy, BAKER design permits easy and quick maintenance.

This demonstration of BAKER speed and flexibility proves again that BAKER basic units are the foundation of today's most efficient drilling and tapping operations.

Perhaps *your* "special machine" problem can be solved by a BAKER standard vertical or horizontal unit fitted with the necessary components.

For the full story on these BAKER machines, write to: BAKER BROTHERS, INC., Dept. MA-460, 1000 POST STREET, TOLEDO 10, OHIO.

NOW...COMPLETELY INTERCHANGEABLE

TO FIT 3 SIZES VERTICAL MACHINES		TO FIT 3 SIZES HORIZONTAL MACHINES
	21 ADJUSTABLE SPINDLE HEADS 27 FIXED SPINDLE HEADS 3 TYPES STANDARD TABLES	

MMT PE

MODERN MACHINE TOOLS PRODUCTION EFFICIENCY

BAKER®

STANDARD AND SPECIAL DRILLING AND TAPPING MACHINES • COMPRESSION MOLDING MACHINES • AUTOMATIC BAR MACHINES

RUGGED to full tool capacity!

...FOR LONG WORKING LIFE TO ELIMINATE DOWNTIME & PRODUCTION LOSSES!

THOMSON THRIFTMASTER DRILLHEADS

DRILL • TAP

REAM • BORE

COUNTER-BORE

COUNTER-SINK

FACE

Tremendous economies from the use of multiple-spindle drillheads are obvious. Use *THOMSON* THRIFTMASTER Drillheads for optimum performance and profits. *Ask NOW for our new catalog.*

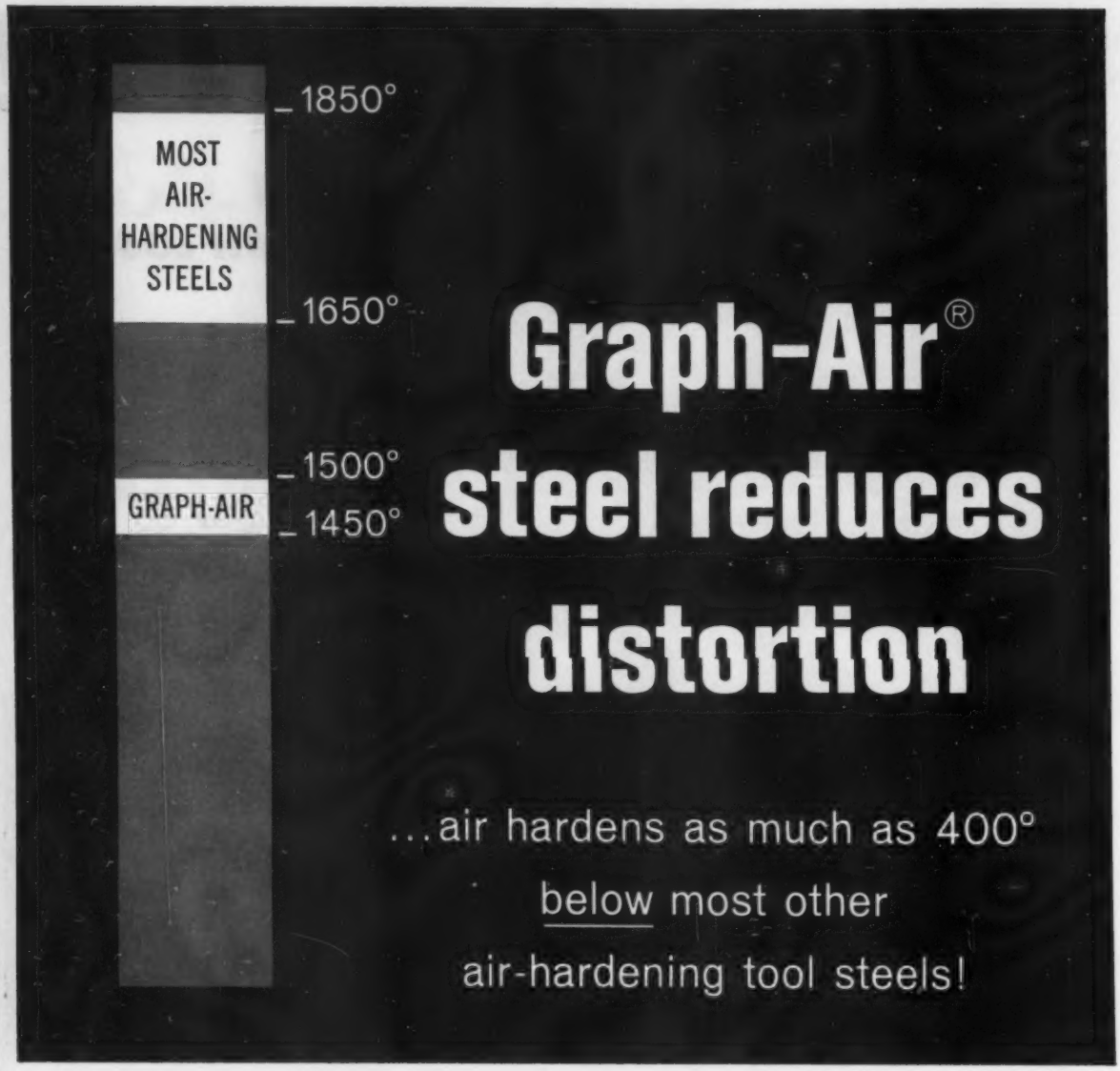
THRIFTMASTER
PRODUCTS CORPORATION

1022 NORTH PLUM ST.
LANCASTER, PENNA.
EXpress 2-2101

Also Makers of DORMAN AUTOMATIC REVERSE TAPPERS

Subsidiary of
THOMSON INDUSTRIES, INC.
makers of BALL BUSHINGS • NYLINERS • 60 Case Shafting

For more data circle this page number on card at back of book



Graph-Air® steel reduces distortion

...air hardens as much as 400° below most other air-hardening tool steels!

You can simplify heat controls and reduce distortion in your heat-treated parts. Graph-Air® hardens at 1450°F.—as much as 400° below temperatures required for other air-hardening tool steels. And these lower temperatures also cut scaling and decarburization.

Graph-Air machines easier too, because of the free graphite in its structure. And because it contains diamond hard carbides throughout, it lasts and lasts—as much as three times as long as other tool steels. What's more, with its built-in stability, Graph-Air holds its accuracy better. It's one of the family of Timken graphitic tool steels, the most stable made.

If you're making intricate sections, you'll appreciate the reduced distortion of Graph-Air. It's ideal for blanking dies that must take a lot of punishment.

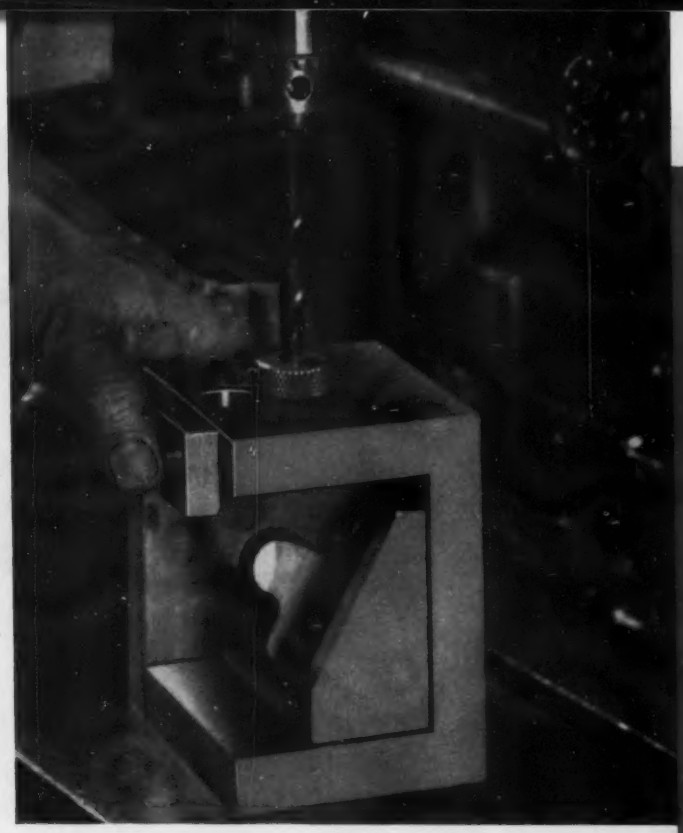
When you buy Timken steel you get . . . *1) Quality that's uniform from heat to heat, bar to bar, order to order. 2) Service from the experts in specialty steels. 3) Over 40 years experience in solving tough steel problems.*

For high quality tool steel that air hardens at lowest temperature, be sure to specify Timken Graph-Air steel. Available in solid and hollow bar sizes. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.

TIMKEN®
***Fine Alloy* STEEL**

See us at the Atomic Exposition, New York Coliseum, April 4-7, Booth 228

TIMKEN GRAPHITIC STEELS ARE CARRIED IN STOCK BY 9 DISTRIBUTORS WITH 47 WAREHOUSES IN 39 CITIES IN THE UNITED STATES AND CANADA



Now—A Low-Cost Way to Build Jigs & Fixtures!

PRE-MACHINED MICRON SECTIONS PUT YOUR TOOLROOM JOBS ON A PRODUCTION BASIS

Next time you need fixtures for short-run milling or drilling jobs, use Ex-Cell-O Micron Sections to produce them quickly and at low, low cost!

High tensile strength cast-iron Micron Sections give you inbuilt accuracy plus substantial savings in design and building time; you eliminate welding, cut machining time.

Simply select the desired shape and size from Ex-Cell-O Bulletin B-5914, and specify the length required; we'll deliver the sections you need—pre-machined and ready for minor detailing.

Micron Sections are available from stock by ordering through your local Representative or direct from Ex-Cell-O. Send for data sheet and price list today.

BRIEF SPECIFICATIONS

Cut to order from 25″ lengths. Wall thicknesses from ⅝″ to 1¼″. Width and height from 3″ x 3″ to 8″ x 8″. Machined square and parallel within .005″ per foot on all surfaces except ends and interiors of hollow shapes.

MMT·PE

EX-CELL-O FOR PRECISION

Machinery Division

EX-CELL-O PRECISION PRODUCTS INCLUDE: MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • ATOMIC ENERGY EQUIPMENT • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

60-7

For more data circle this page number on card at back of book

PRECISION:

Reason enough

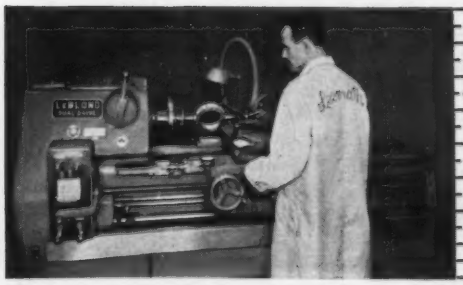
Beryllium specialists, Leemath Incorporated of Long Island, create delicate and precise mechanisms in this high strength but toxic and abrasive wonder metal. In their temperature-controlled shop, this feather-light gyro float assembly (shown actual size, right) was turned on a special high-precision LeBlond Dual-Drive Lathe. *Spherocity had to be concentric with the two major axes within .0005" total indicated runout of 1.8750"!* (In order to hold the assembly that close, component tolerances had to be even tighter!)

To perform such touchy work, Leemath ordered their LeBlond 15" Dual-Drive to ultra-high precision standards. For this lathe Timken furnished specially-made bearings with one-third the runout of their finest precision class. With it came the standard features that give LeBlond its reputation for long-lived precision—combination gear-belt drive headstock with 16 speeds, 31 to 2400 rpm; compensating vee bed way construction with hardened steel shears; thrust-lock tailstock; and many more.

People buy lathes for many reasons. But when, like Leemath, they must have precision they can depend upon, that is reason enough to buy LeBlond.

If you would like to have the full story of LeBlond's Dual-Drive, ask your distributor or write for Bulletin 6A.

to buy LeBlond



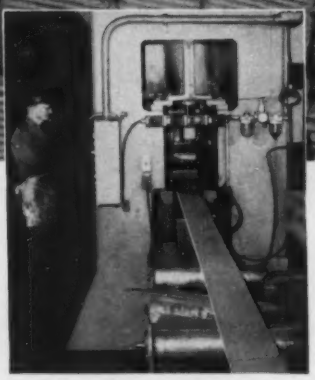
LeBLOND of Cincinnati

THE R. K. LeBLOND MACHINE TOOL COMPANY
Cincinnati 8, Ohio

For more data circle this page number on card at back of book

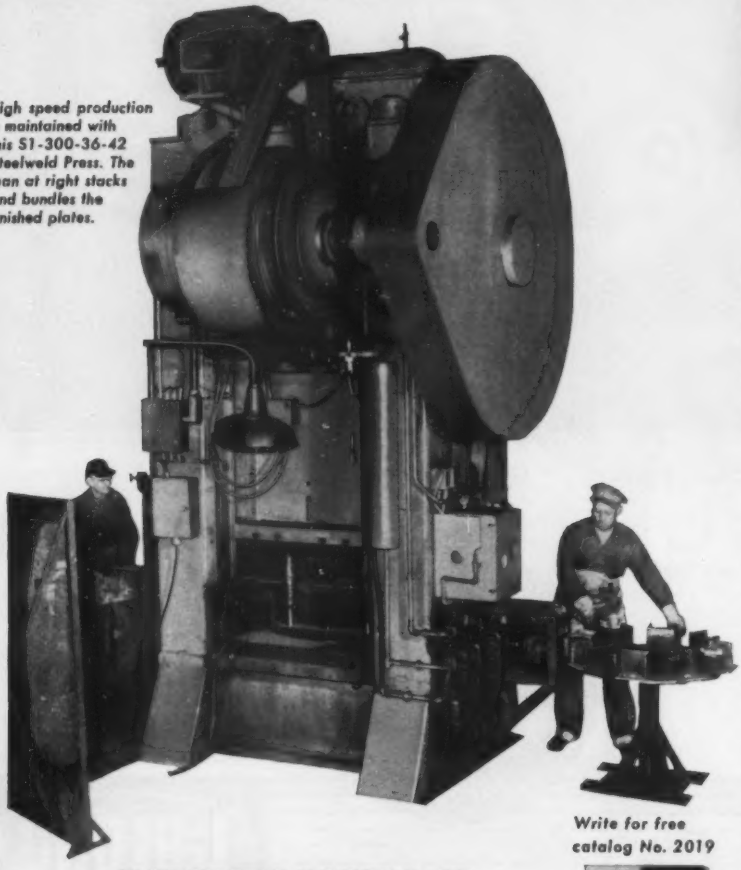
STEELWELD SINGLE POINT PRESS produces 400,000 mine plates monthly

These bundles of finished "West Virginia" brand mine roof bolt washer plates represent little more than an hour's production on the Steelweld Press.



Long strips of steel feed through from side of machine automatically.

High speed production is maintained with this S1-300-36-42 Steelweld Press. The man at right stacks and bundles the finished plates.



A single-point straight-side 300-ton Steelweld Press at the West Virginia Works of Connors Steel Division, H. K. Porter Company, Inc., Huntington, West Virginia, is used exclusively for the production of one item—"West Virginia" brand mine roof bolt washer plates. With an operating speed of 40 strokes per minute, very little time is lost with this machine.

Strips of flat steel are fed into one side of the press, and the completed washer plate parts come out of the other. Movement of the steel through the machine and punching are done automatically.

"West Virginia" brand mine roof bolt washer plates are produced in 3—4—6 and 8 inch squares and thicknesses of ¼ and ⅜-inch. A hole is provided in the center with a saucer-like elevation around it. A second smaller hole is punched simultaneously about midway between the center bolt hole and one corner for insertion of a "Sky Hook" or roof bolt suspension arm.

Steelweld Presses have many outstanding features to offer, as Connors Steel Division and other leading users in automotive, agricultural equipment, heavy fabricating and other industries have learned. Our sales engineers will be glad to give you the details.

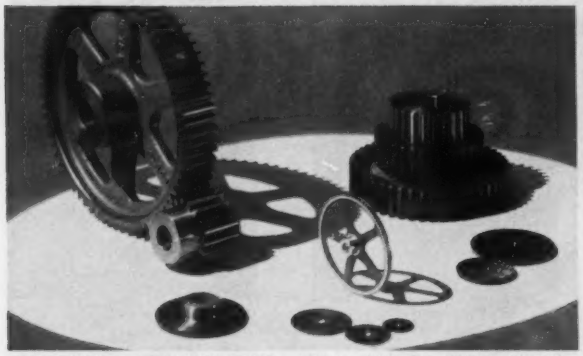
Write for free catalog No. 2019

STEELWELD
STRAIGHT-SIDE PRESSES

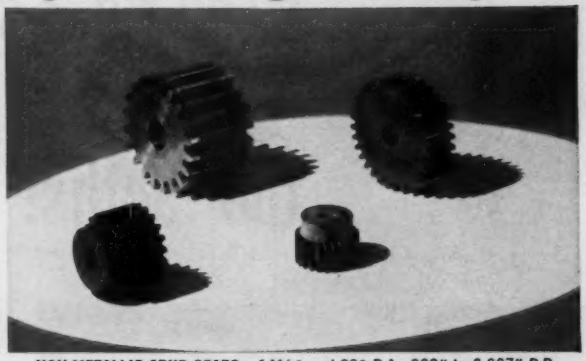
Steelweld Machinery includes: Mechanical & Hydraulic Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

STEELWELD MACHINERY DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 5402 E. 280 ST. • WICKLIFFE, OHIO

Design around gears you can get today

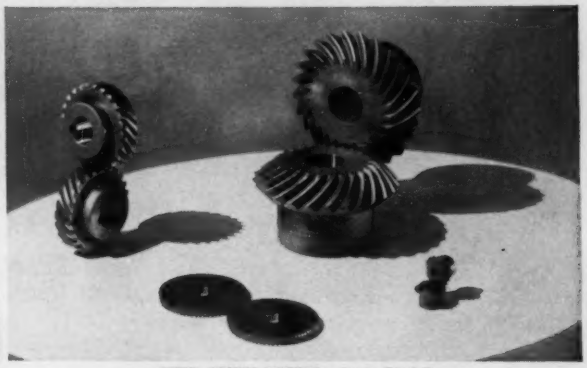


SPUR GEARS — STEEL, IRON, BRASS 14½° and 20° P.A. .208" to 40" P.D.

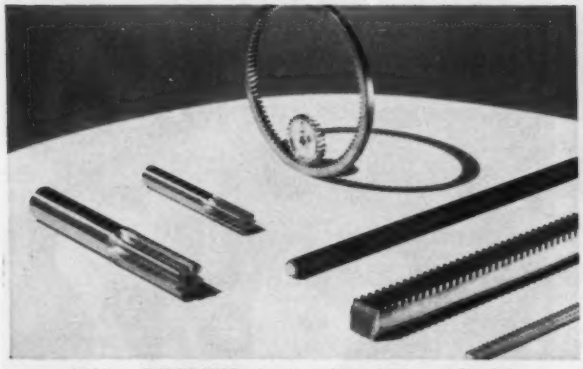


NON-METALLIC SPUR GEARS 14½° and 20° P.A. .938" to 6.667" P.D.

BEVEL and MITER GEARS Steel, Iron, and Brass 20° P.A. .312" to 14" P.D.



STEEL SPIRAL MITERS 1" to 5" P.D.
HELICAL GEARS Steel and Bronze .333" to 6" P.D.



RACK • PINION WIRE Steel and Brass 14½° and 20° P.A.
PINIONS • INTERNAL GEARS

WORM GEARS Bronze and Iron .417" to 18" P.D.
WORMS .333" to 4" P.D. Soft steel and hardened and ground steel

Build it better...for less...without delay

Design around standardized BOSTON Gears FROM STOCK is the quickest (and lower-cost) way to get your project "off the board" and in production — whether it's a prototype, a product for resale, or new equipment for your own plant. Catalog No. 57 lists over 2000 gears.

Your nearby Distributor will help you simplify planning and show you how to get the biggest benefits from BOSTON Gear standardization — in lower costs, in easier maintenance, in simplified servicing. Boston Gear Works, 65 Hayward St., Quincy 71, Mass.

OFF-THE-SHELF
FROM STOCK
AT FACTORY PRICES

CALL YOUR NEARBY BOSTON Gear DISTRIBUTOR

"Yellow Pages"

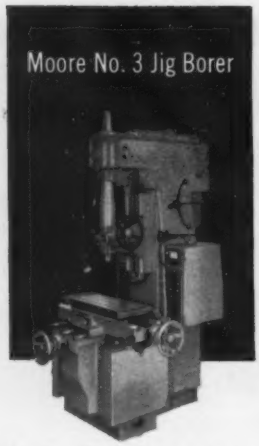
— STANDARDIZATION PAYS —

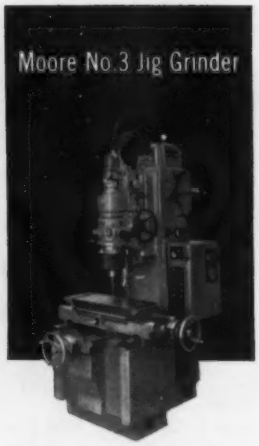
Advt. copyright by Boston Gear Works

Visit us in Booth 1105
at the ASTE Show

"The No. 3's split the tenths!"

So report users of Moore's New Jig Borer and Jig Grinder





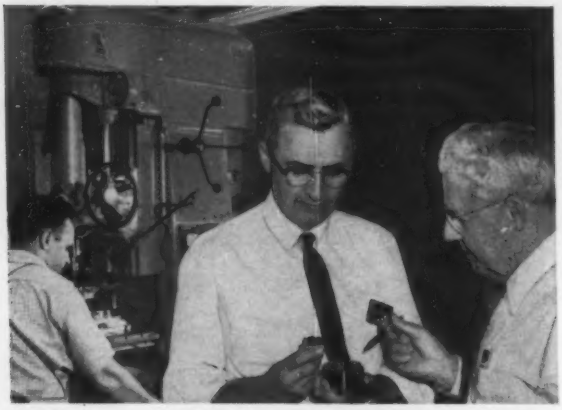
You will easily break the "tenth" barrier with this accurate machine. No gibs...no overhang...improved drive ...speed range of 60 to 2250 RPM...11 x 24" table working surface. It bores, drills, reams and spots holes in dies, jigs and production parts with unequalled speed and accuracy.

With this new, larger No. 3 model, you can grind—*with split-tenth* accuracy—holes plus regular and irregular contours to size and location after hardening. Faster strokes are provided for chop-grinding... infinite spindle speeds, 40 to 250 RPM...larger table working surface, 11 x 24".

All hardened, ground and lapped ways. Made and calibrated to the new international inch.

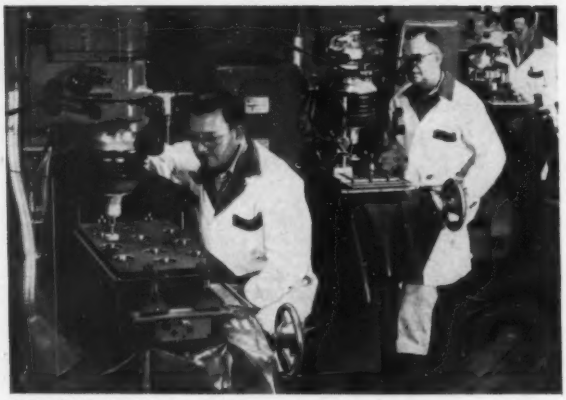
Write today for literature describing the many advantages of the No. 3 Moore Jig Borers and Jig Grinders.

MOORE SPECIAL TOOL COMPANY, INC.
800 Union Avenue, Bridgeport 7, Conn.



"Our operators feel that these are the best machines they have ever worked on. They take care of the tenth-splitting tolerances required by industry today. Over the years we have enlarged our Moore Jig Boring and Jig Grinding Department to 15 machines." These are the words of Herbert Harig, President (left above), and Karl Harig, Chairman (at right), Harig Manufacturing Corporation, Chicago, Illinois.

Among the highly skilled toolroom operators in the Federal Products Corporation, Providence, Rhode Island, is this talented jig grinder operator, Mrs. Florence Smith. Mrs. Smith achieves ultra-precise results with the No. 3 Moore Jig Grinder.

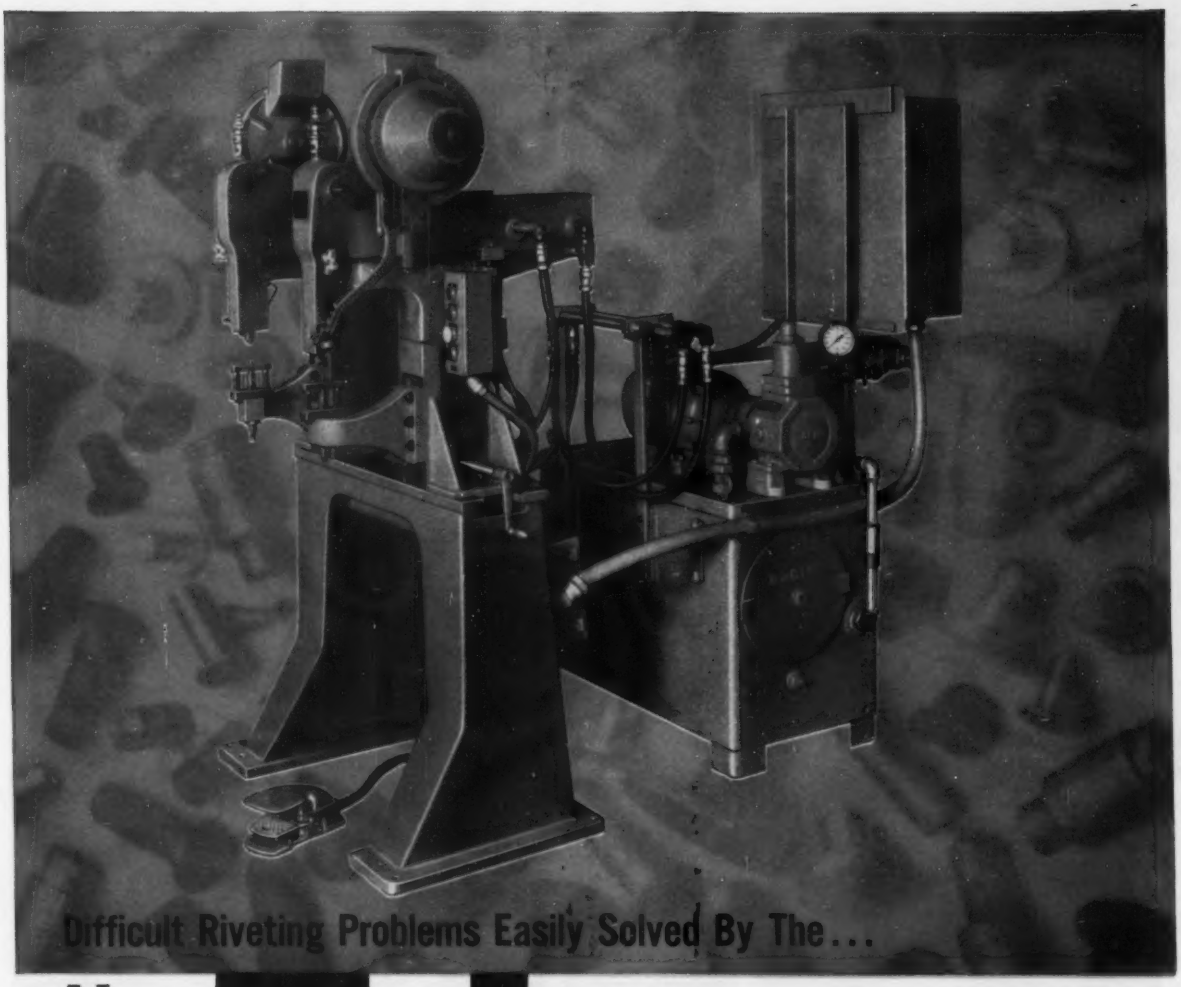


"We have found that it costs real dollars and cents to operate without Moore equipment. This cost factor is just one of many reasons why we recently added the new Moore Model No. 3 Jig Grinder. This Machine, with its tenth-splitting accuracy, hardened ways and wider range, enables us to service more customers better." Statement by Val Koller, President, Koller Die & Tool Co., Milwaukee, Wisconsin.

HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts the modern way. 424 pages, 495 illustrations. $5 in U.S.A., $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES



New T-J HYDRAULIC DUAL RIVITOR

With Increased Riveting Production • Quality • Versatility

Added recently to the versatile T-J line of unit and production line riveting and clinching machines is the new Hydraulic Dual Rivitor. The Model HDR will set two ¼″ solid steel rivets at once with adjustable spacing from 1-½″ to 18″ maximum, center to center, being fed from 10″ hoppers. Operating cycle is approximately .8 second, at 420 P.S.I. oil pressure furnished from a hydraulic power unit with maximum of 1000 P.S.I. output. For complete specifications write to The Tomkins-Johnson Co., 2425 W. Michigan Ave., Jackson, Michigan for Bulletin HDR-4-59.

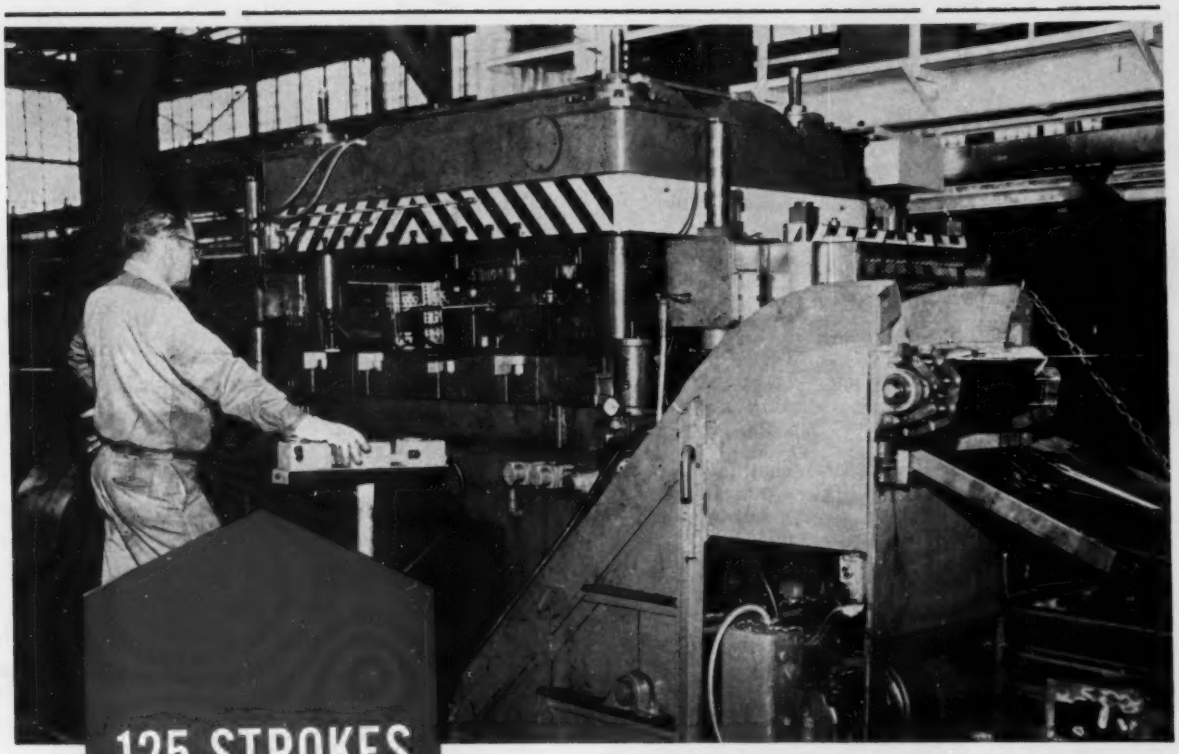
For information on other T-J Rivitors and Clinchors write for Bulletin No. 555.

T-J TOMKINS-JOHNSON
RIVITORS . . . AIR AND HYDRAULIC CYLINDERS . . . CUTTERS . . . CLINCHORS

For more data circle this page number on card at back of book

Milford Rivet & Machine Company reports . . .

Precision Parts Ground
20 TIMES FASTER
when put on the No. 18 Blanchard
"408 precision washers, in one chuck load, now surface ground in same time as 20 by former method . . . substantial savings on all other Blanchard-ground jobs . . . finished work quality outstanding . . . former sub-contracted jobs now done at less cost in our own shop . . . operator fatigue practically eliminated . . . maintenance is very low."
Are you missing opportunities like these by not using Blanchards on your surface grinding jobs? Write for your copy of "Work Done on the Blanchard"
THE BLANCHARD MACHINE COMPANY
64 State Street, Cambridge 39, Mass., U. S. A.
BLANCHARD
W-1177



This Henry & Wright Double Crank Dieing Machine has been in constant use for three years with negligible maintenance costs. It is used on a wide variety of jobs with almost daily die changes.

125 STROKES PER MINUTE on a 300 TON PRESS with a 6″ STROKE

This is a lot of strokes per minute for a 300-ton automatic press especially on a part requiring a 6″ stroke. This is one of the reasons why The Budd Company, Philadelphia, chose high production Henry & Wright Dieing Machines. They also needed flexibility for a wide range of short-run jobs; accurate die guiding to assure minimum wear on expensive, multi-stage progressive dies averaging 8-stages each; automatic material feeding and parts ejection; quick and easy die changing . . . all so necessary to stay profitable in the highly competitive stamping business.

You'll find Henry & Wright machines will meet every production requirement. The 6″ stroke, high tonnage job described in the headline is a severe test for any heavy automatic press. If you need more production, at competitive costs, for a variety of jobs, ask now about the high production Henry & Wright machines. Your inquiry will receive our prompt attention. Sizes from 25 to 500-ton capacity.

THE HYDRAULIC PRESS MANUFACTURING COMPANY
A Division of Koehring Company • Mount Gilead, Ohio, U.S.A.

HPM

H41

For more data circle this page number on card at back of book

Open secret of New Britain superiority

Wide-open design makes the most fundamental difference between a New Britain automatic chucking machine and other machines. It speaks for itself as a means of getting at the tooling, making adjustments and clearing chips.

Massiveness, right from the floor up, is equally apparent and equally important in chucker work. You see it in the way the cutting tools make the heaviest cuts with a chatter-free smoothness that can't be duplicated.

Only New Britain provides a combination of longitudinal with transverse forming motion where needed. This versatility eliminates the need for second operation machines in many cases—particularly when a job is setup for double indexing for fast two-at-a-time production.

New Britain spares no pains to incorporate every new development to make chucker-type machining more profitable. The open-end design lends itself particularly well to magazine loading and unloading, for example, and many New Britains are being equipped to provide this feature.

Whenever a number of operations are required on cast or forged pieces, these massive, rugged, powerful machines offer great possibilities for savings through faster, more accurate, more reliable production. A new and complete catalog on the New Britain chucker line is just off the press. We would be very glad to send you your copy.

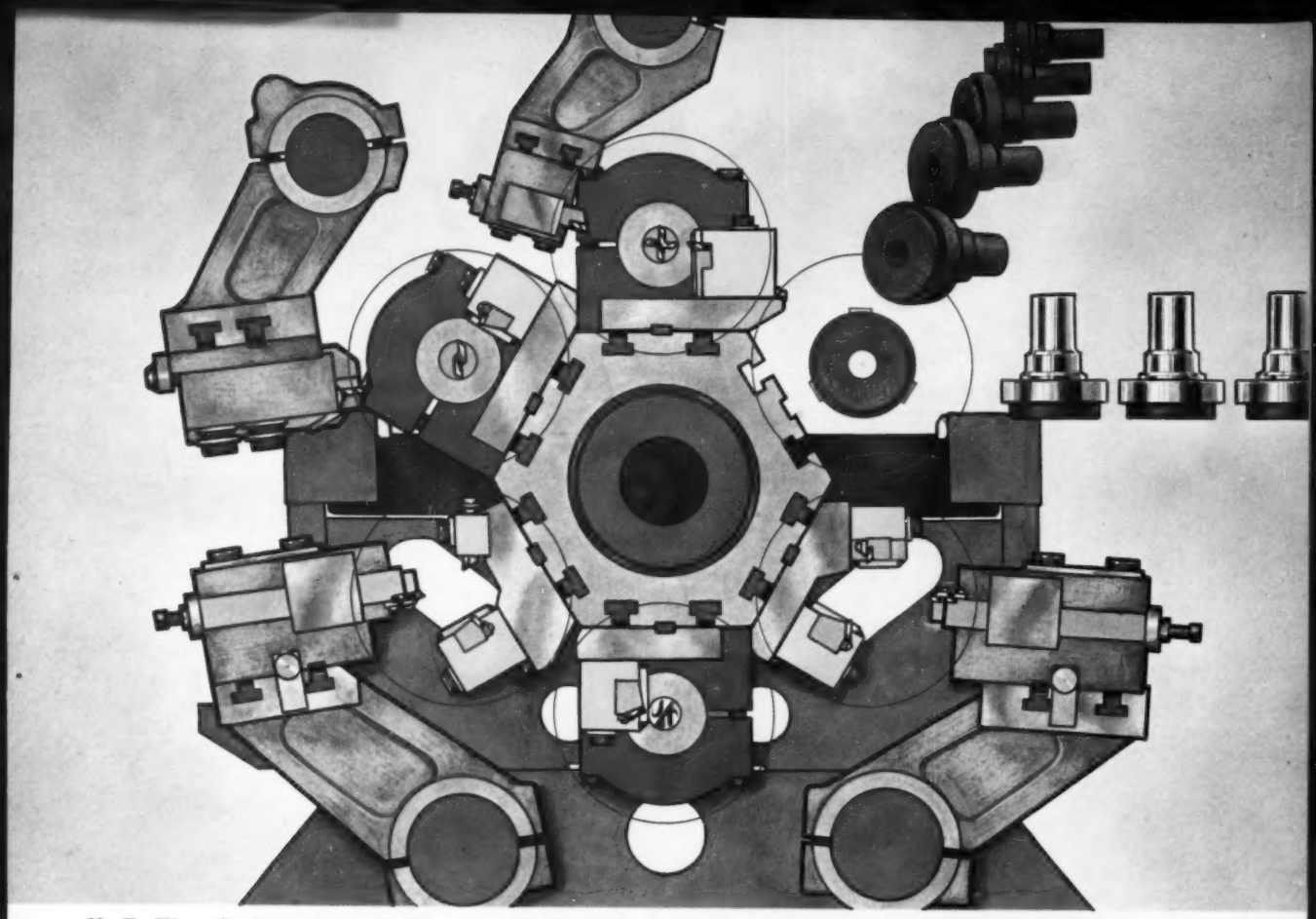
THE NEW BRITAIN MACHINE COMPANY

New Britain's answer to a serious threat

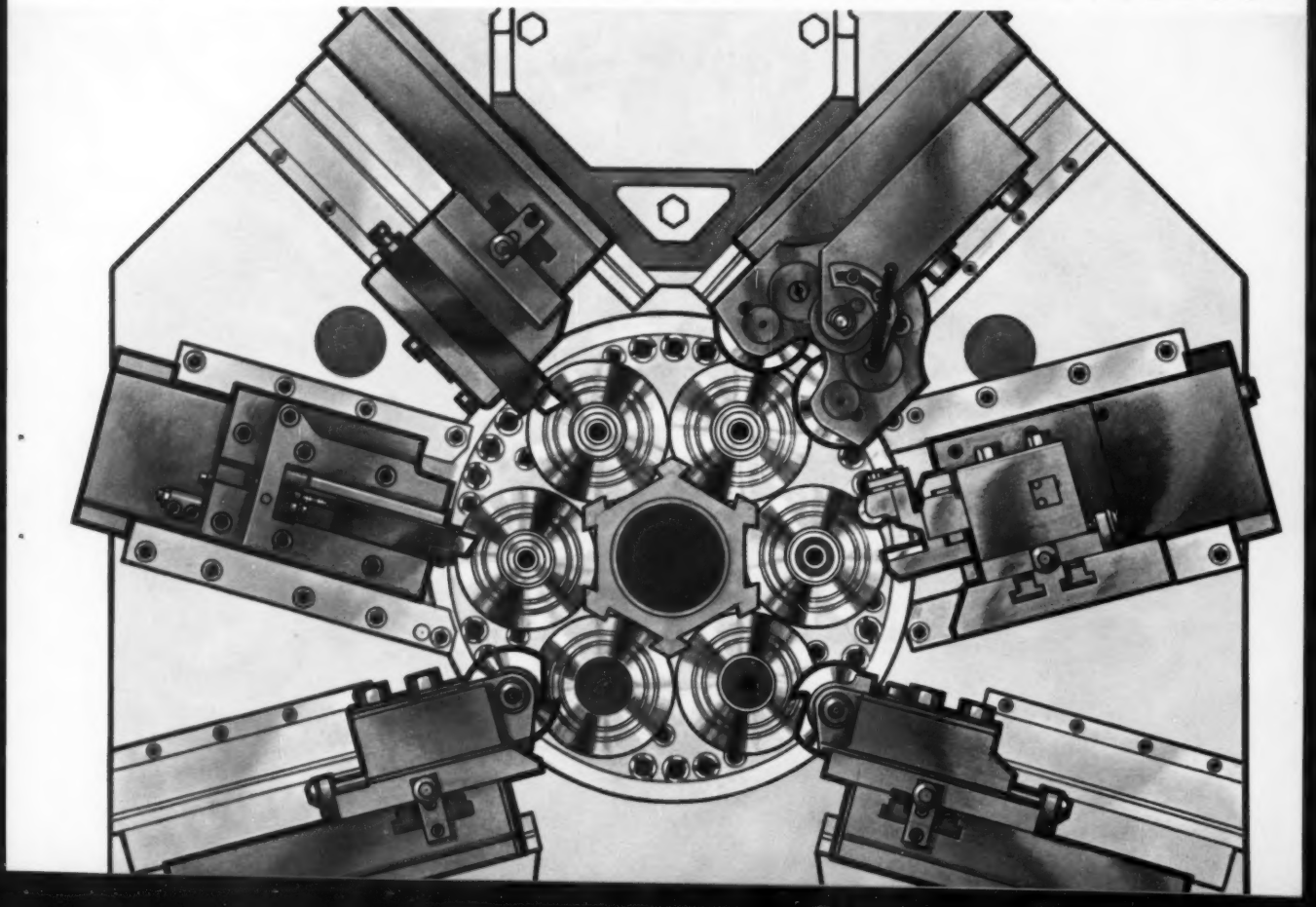
Overseas production of just about anything you care to name is making serious inroads on American domestic and foreign markets. It's no secret that European and Asian industry is catching up fast technologically—and they have a real competitive advantage in plenty of low cost skilled labor. While many foreign products are still inferior to those of domestic manufacture, this is far from true in all cases. The answer is, of course, increased productivity at lower cost.

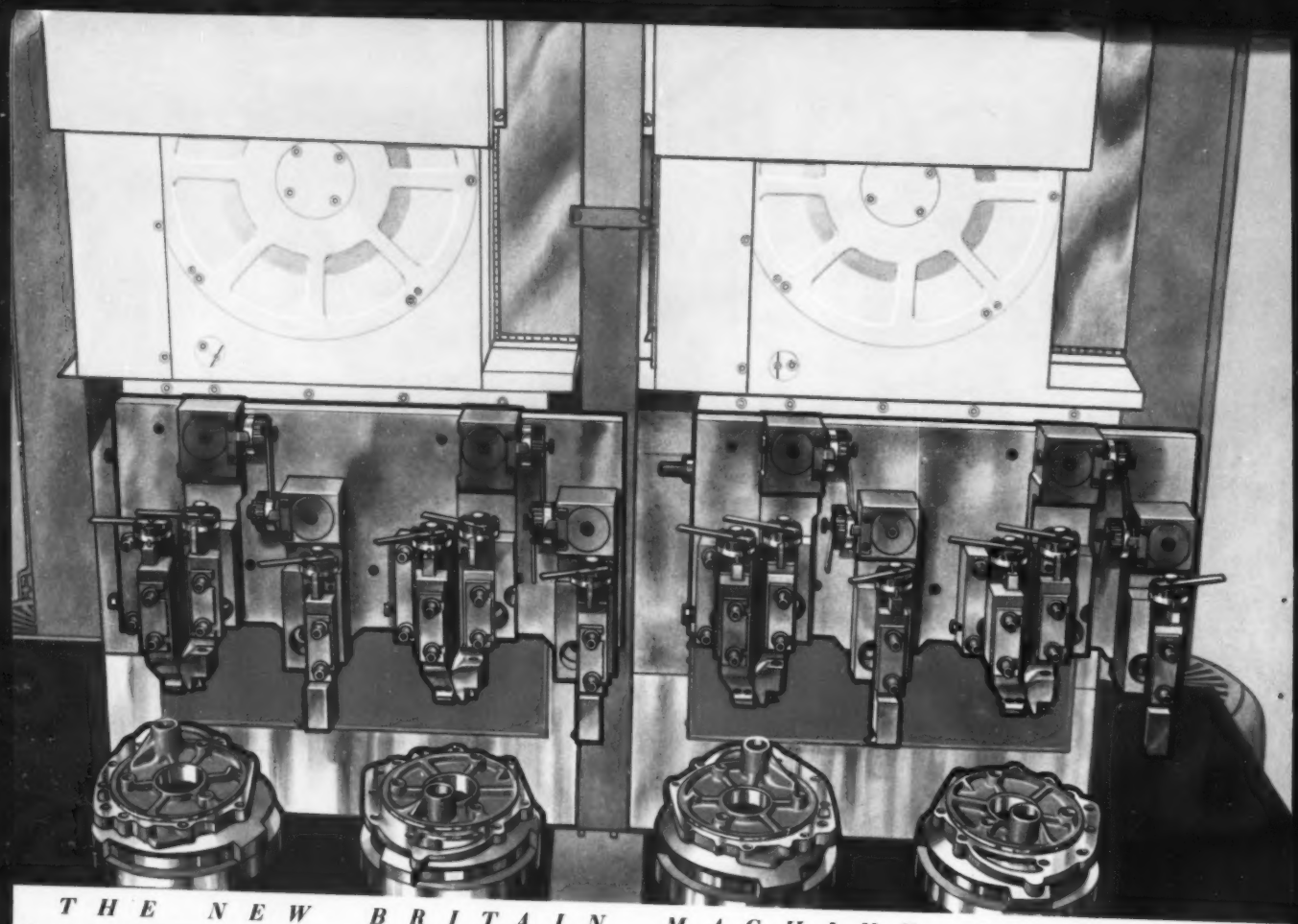
In its all-new line of bar machines, New Britain has developed the most modern bar-turning units available. Five models in two different series are offered with capacities from 1¼" to 5⅛". These machines are designed for really fast, trouble-free, high-precision production. More operations per machine are possible than ever before. Wide open tool areas allow unlimited combinations of end working and forming tools. New Britains will stay new longer. The exclusive wear-preventing features so familiar to New Britain users have been retained and improved. Catalogs on both the small and large series machines are yours for the asking. After looking this literature over if you think one or more New Britains may help improve your competitive situation, we will be happy to review your prints and arrange a demonstration. No obligation, of course. Call us or call your local representative.

New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

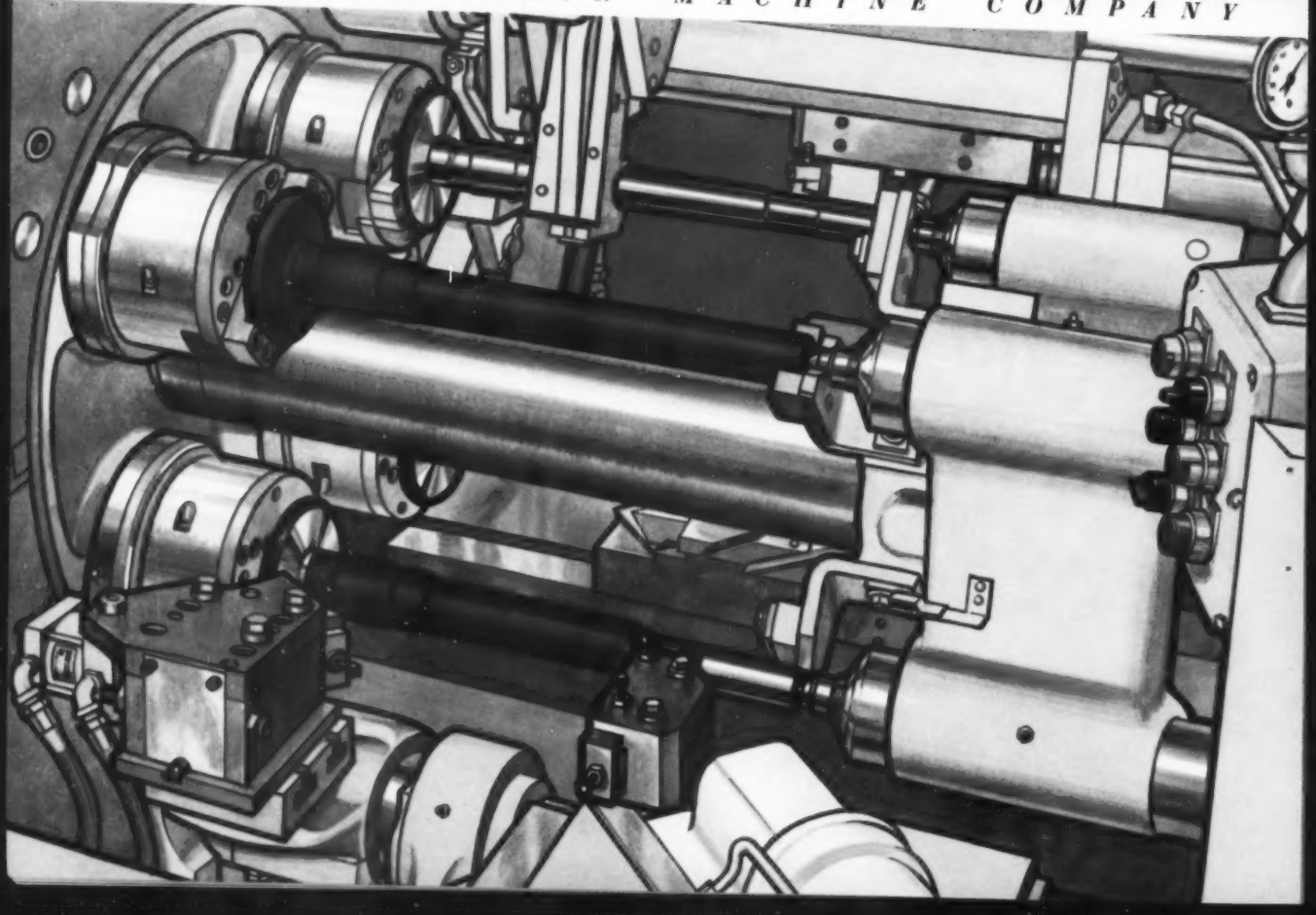


NEW BRITAIN - GRIDLEY MACHINE DIVISION





THE NEW BRITAIN MACHINE COMPANY



Precision boring
New Britain's new approach

New Britain Cam Actuated Vertical Precision Boring Machines offer an entirely new principle for more accurate boring and turning, plus compact exterior design and fast tooling. Rough cuts and finish cuts within close tolerances on the same set-up are characteristic. Standard models are available with maximum swing from 12″ to 17¾″ in 10 or 15 horsepower.

Here are a few of the major new developments incorporated in these unusual machines.

Greater accuracy. Both the vertical and cross slide cams are mounted on a common shaft which is contained inside the vertical slide. The linkages found in conventional cam-operated contouring machines are eliminated. Both the vertical and cross slides ride on preloaded roller bearings and are deflection-free.

Clean-sided design. Any number of these self-contained machines, each with one or more spindles, can be arranged side by side. Depending on how they are tooled, they operate either as a single unit or as individual machines. Parts can be inverted on adjacent machines or on adjacent spindles of the same machine, finishing both sides, completing *all* operations in one integrated, high-volume operation.

Fast tooling. Unrestricted accessibility allows rapid tool and cam changes.

Complete catalog material is available.

NEW BRITAIN · GRIDLEY MACHINE DIVISION

Idea for volume producers of shafts

Economists are making startling predictions on this year's increase in productivity. They say it will be twice that of recent years—up as high as 10% in some manufacturing industries.

Whether or not these predictions come to pass, it's certain that it won't happen in plants using outdated equipment.

Shaft work is a problem to many firms. New Britain pioneered template-controlled contour turning and boring, solving the problem for many progressive companies. Now for the manufacturer with really high volume requirements we present Model 412/25–a four-spindle, template-controlled machine capable of producing a four-fold increase in productivity per man hour.

The basic principle pretty much speaks for itself. As in the case of the single-spindle contour lathe, inexpensive metal templates control the full cycle and re-cycle if required. Simple, single-point tools replace complex gang tooling. Setup is simple and fast. When tools wear, merely replace them. Since all relationships are maintained by the template, tool replacement involves no problem.

When the volume of contour turning warrants it, this machine can be the best money maker on the production floor. Your New Britain representative can quickly tell you after looking at your prints and learning of your production requirements. Meanwhile, we would be glad to mail you descriptive literature containing the basic facts and specifications. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

HOW CAN NICE HELP YOU?

NICE offers...

. . . complete lines of precision, semi-precision and unground standard bearings.

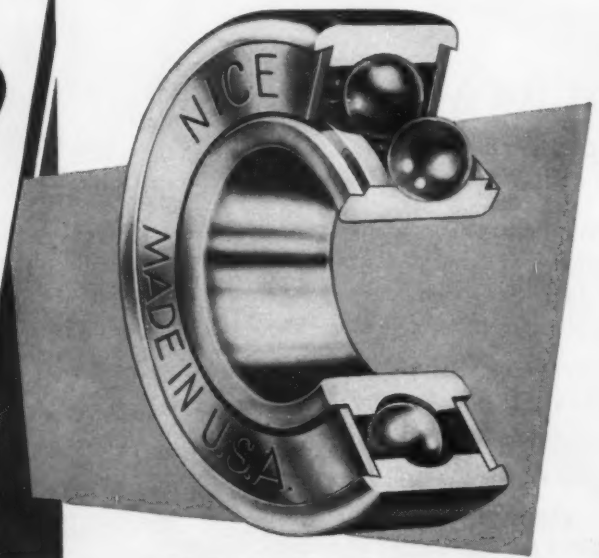
. . . facilities and "know-how" to design and produce "specials" to exactly suit individual bearing application requirements.

. . . standard and special bearings that offer Product Designers many design improvement and cost-saving opportunities.

. . . bearings that have proved their economic and performance value in the accepted products of many hundreds of well-known manufacturers.

. . . NOW . . . the revolutionary new UNIBAL, a low cost bearing of superior quality, suitable for many precision bearing applications. UNIBAL construction features solid inner and outer raceways, with deep, unbroken ball grooves and a full complement of balls. Unique new and patented manufacturing methods produce bearings of exceptional durability and strength.

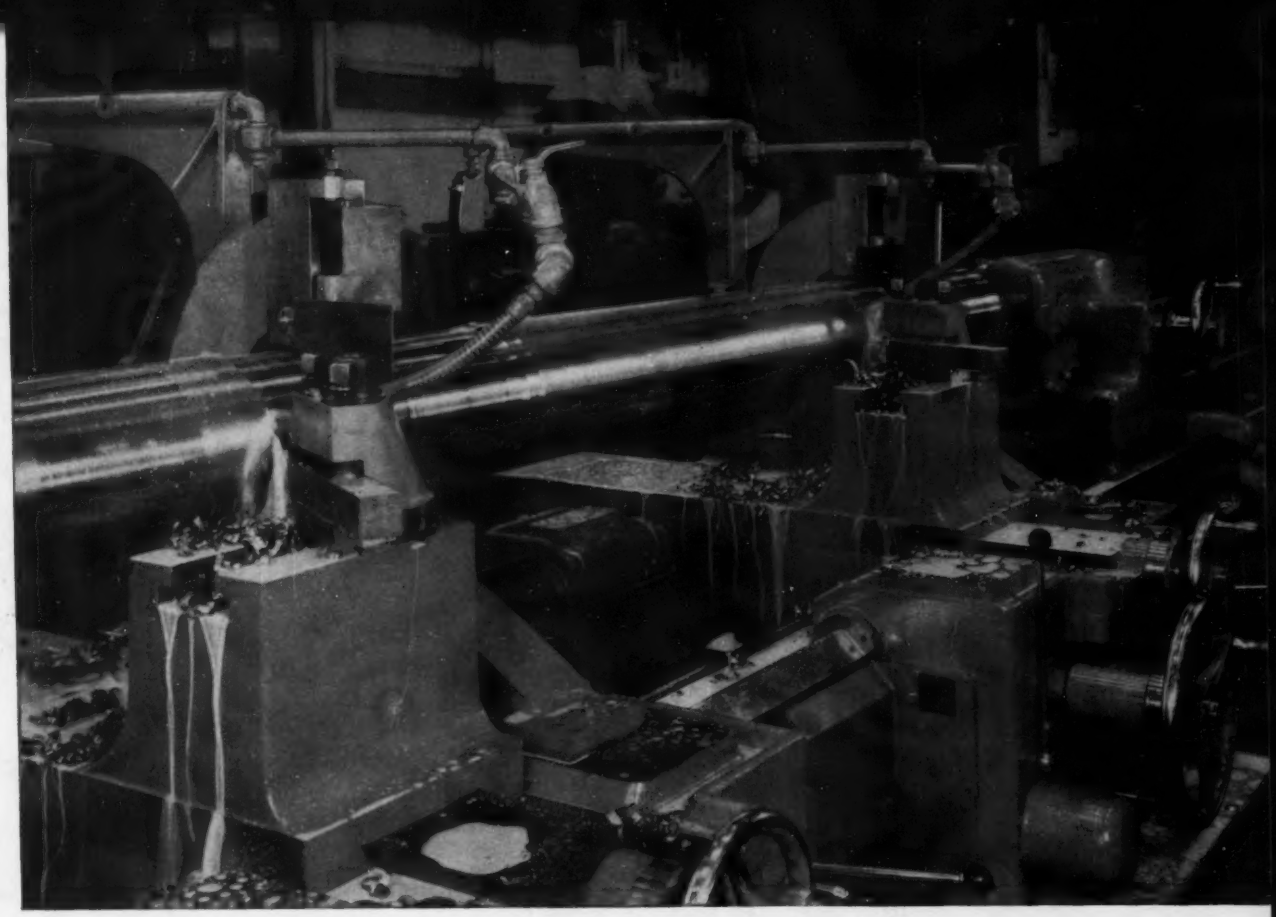
How can NICE help YOU?



As illustrated above, the new UNIBAL Ball Bearing features solid inner and outer raceways, with deep, unbroken ball grooves, *plus* a full complement of balls.

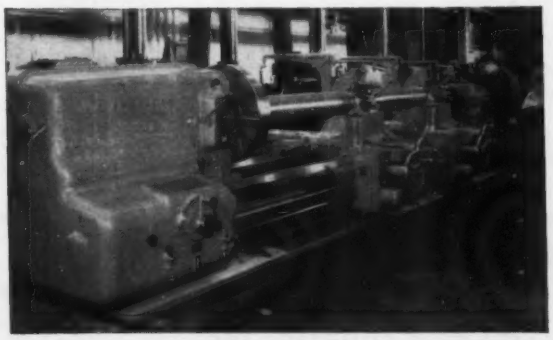
NICE

NICE BALL BEARING COMPANY
DIVISION OF CHANNING CORPORATION
NICETOWN · PHILADELPHIA · PENNSYLVANIA



● *Cutting with two Carriages equipped with plain block rests and follow rests.*

MACHINING TITANIUM BILLETS



● *32 inch "American" Double Carriage Pacemaker Lathe.*

An extremely difficult job — a real challenge to the rigidity, stamina and "staying" qualities of any lathe.

Cutting titanium offers terrific resistance to the cutting tool which in turn demands maximum rigidity of the tool supporting members in order to hold vibration to the very minimum; otherwise chatter and high tool mortality are inevitable.

The fact that all of the major titanium fabricators are using "AMERICAN" Lathes, selected only after repeated demonstrations, is conclusive testimony to the power, stamina and rigidity of these machines.

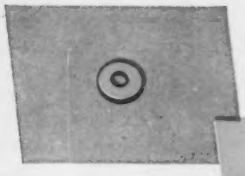
There are exclusive features which definitely contribute to this result, such as the wide, four vee bed with walls rigidly tied together between the girths by an angular web which forms a chute for quick disposal of chips; replaceable hardened tool steel vees; solid 3-vee mounting of the carriage on the bed; powerful headstock with triple bearing spindle and bearing adjustment from the outside and others which space limitations prevent mentioning.

For a complete description of all of these features just send for bulletin No. 144.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Superb Stampings



from the simplest, tiny washer

to precision stamped Rocker Arms

—and everything in between!

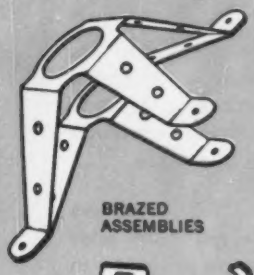
We deliver superb stampings . . . anything from hub caps for baby carriages to vane locks for aircraft turbines—with tolerances well within the accepted standards of those industries.

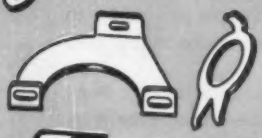
Point is, we deliver *exactly* what you want. *That's* why we say our Stampings are "superb". You'll say it, too.

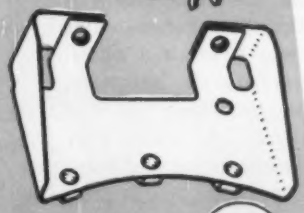
How do we do it? By applying the best of our own three Methods: the "ONE PLUS" METHOD avoids tooling charges . . . the SHORT RUN METHOD employs our own temporary tooling . . . the PRODUCTION RUN METHOD uses special dies at nominal cost.

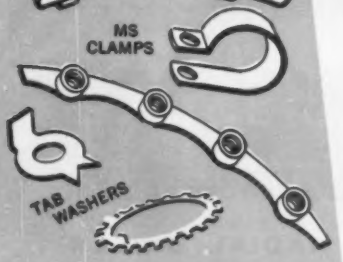
Either way, you get exactly the Stampings you need—faster, better, and at surprisingly low cost. Our routine WATCH DOG SERVICE sees to *that*.

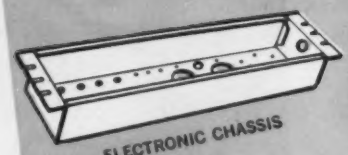
QUANTITY? Anything from one to a million!

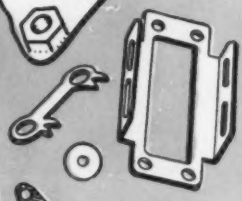


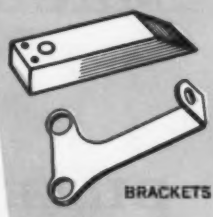












Stampings DIVISION

THE LAMINATED SHIM COMPANY, INC.
3904 UNION STREET, GLENBROOK, CONNECTICUT

Interesting STAMPINGS FOLDER NO. 3 contains helpful information for ordering Stampings most economically. Send for your copy. No obligation.

- **Air Force Orders World-Wide Machine Tool Inventory**
- **MAPI Studies Challenge to Basic Patent System**
- **Navy Seeks Materials Now Unknown**
- **Metalworking Equipment Division Changes**
- **Internal Revenue Dept. Urges Depreciation Rule**

Keeping up with Washington

— Loring F. Overman

THE AIR FORCE has ordered the first world-wide inventory of all its in-use machine tools and production equipment. The inventory—considered a first step toward large-scale modernization of machine tools—does not apply to equipment in contractor plants or in the Air Force Industrial Equipment Reserve. A new regulation (AFR 67-42) outlines procedures for the inventory, which will include all in-use equipment having a unit value of $500 or more. The count has started, with May 1 as the target date for completion.

The regulation comments:

"Many of the items of machine tools and related production equipment now in use at Air Force installations will no longer perform the required work in the manner desired because they are old, inefficient, and/or obsolete. This age condition (many machines being fifteen years old or older), together with the impact of technological advances in both the weapon system and machine tool areas, has brought about the urgent need to replace these tools with modern and more efficient equipment."

Each Air Force installation is to report to the Directorate of Industrial Production Equipment (WRU), at Warner Robins Air Materiel Area, Macon, Ga., the Air Force central inventory control and management center.

• MAPI Studies Challenge to Basic Patent System

"ARE the basic tenets of the American patent system being challenged?" Efforts to resolve the foregoing question and to guide industry and the Government in charting an acceptable policy for the future now represent a major project for the Machinery and Allied Products Institute.

Its activities have included: testimony before hearings conducted by three Congressional Committees—Subcommittee on Legislation of the Joint Atomic Energy Committee, Subcommittee on Patents and Scientific Inventions of the House Committee on Science and Astronautics, and the Monopoly Subcommittee of the Senate Small Business Committee. MAPI testimony has been reprinted and documented in a 120-page booklet, "Federal Patent Policy," available at $1.50 from Machinery and Allied Products Institute, 1200 Eighteenth St., N. W., Washington 6, D. C.

The patent question, MAPI observed, is raised by the fact that nuclear and space developments—most of them under government sponsorship—involve the problem of disposing of rights in inventions conceived under government research and development contracts. Within the Government there are several schools of thought, some holding that a complete overhaul of the patent system is indicated. The MAPI viewpoint is that business must voice its opinions promptly to protect its traditional position.

• Navy Seeks Materials Now Unknown

MACHINERY manufacturers will be working with hitherto unused metals and materials if the Navy has its way. Addressing a recent conference of metallurgical scientists and engineers, Navy spokesmen told of problems whose solution awaits the development of metals and materials not now in existence. Problems, according to Naval Research Chief Rawson Bennett, include submarine hulls for deep diving, high-temperature structural materials for space craft and nuclear reactors, suitable materials for thermo-electric generation, and semiconductors for advanced applications.

• Metalworking Equipment Division Changes

NIELS A, OLSEN, for many years chief, Metalworking Equipment Division, Business Defense Services Administration, is one of six government veterans named to be the first coordinators of regional offices of the Office of Civil and Defense Mobilization. Mr. Olsen heads Region VI, at Santa Rosa, Calif. Succeeding him as acting chief, BDSA Metalworking Equipment Division, is Philip A. Bennett, former chief of the program policy branch of the division. Henry Magnussen continues as civilian advisor to the division under the Government-industry WOC program.

• Internal Revenue Department Urges Depreciation Rule Change

IDENTICAL BILLS (H.R. 10491 and H.R. 10492) which would treat a gain from the sale of depreciable property as ordinary income to the extent of the depreciation deduction previously taken on the property have been introduced in Congress at the request of the Treasury Department.

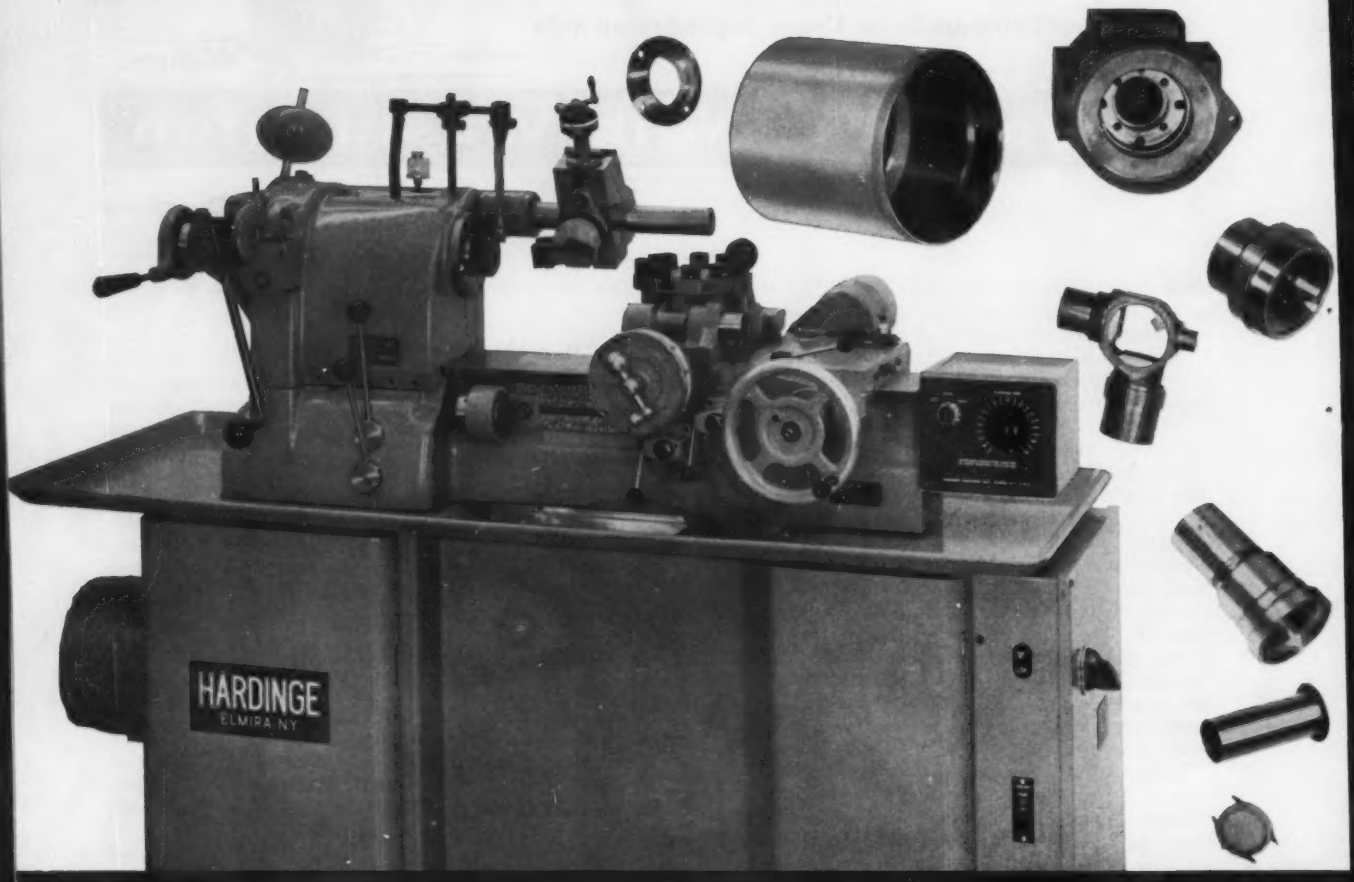
In transmitting copies of the bills to the President of the Senate and to the Speaker of the House, Treasury Secretary Anderson observed: "Informed opinion often differs as to the period of time over which an item of machinery may reasonably be expected to be useful to the taxpayer in his trade or business. The proposed statutory change would make it possible for agents of the Internal Revenue Service to accept more readily tapayer judgments and taxpayer practices with respect to depreciation rates and salvage value. In short, if enacted, the proposed legislation, by eliminating the opportunity which now exists of converting ordinary income into capital gains, would contribute to sound administration of the depreciation laws."

HARDINGE
ELMIRA, N.Y.

PRECISION CHUCKING MACHINE

Users say:

"We now get Production with Tool Room Accuracy"



Users enthusiastically tell us how they can easily maintain close tolerances, get better parts finish, and at the same time substantially cut costs . . . when they put Hardinge High Speed Precision Chucking Machines to work.

These results are possible because parts are finished in one setting with simplified tooling. All parts shown were produced with standard tool bits.

1 1/16" Collet Capacity— 6" Chucking Capacity— Write today for Bulletin HC-HCT which presents the whole story.

269 Lafayette St., New York, N.Y.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

$M_MT=pE$

SMALL RED PINS bearing the formula which appears as the title of this editorial have been seen during recent months on the coat lapels of men connected with the machine tool industry. The same symbols have appeared on advertisements run in technical and business magazines by the builders of machine tools, as well as on letters from such companies. The pins, in particular, were expected to become a topic of conversation between sales engineers and their customers. The exact meaning of the symbols was supposed to be kept a secret until the first of this month.

That date having arrived, the meaning of the formula can be disclosed. MMT=PE means "Modern Machine Tools Equal Production Efficiency." It is a slogan conceived to promote interest in the coming Machine Tool Exposition to be held in Chicago next September.

Following out this promotion idea, certain articles to be published in MACHINERY during the coming months will stress the fact that production efficiency *demands* modern machine tools. These articles will carry the slogan alongside their titles.

Production efficiency in metalworking shops at all times depends upon using the latest types of manufacturing equipment whether it consists of machine tools, welding equipment, metal-forming machines, cutting tools, or coolants. The slogan, therefore, is an apt one at all times and for all capital-equipment shows.

We repeat: MMT=PE or Modern Machine Tools Equal Production Efficiency.

Machinery
APRIL 1960

Charles O. Herb

EDITOR

but only one was right for the job

Severe stresses imposed by this forming operation caused a high rate of reject for a fabricator using hot rolled plate to the usual ASTM—A7 specification. A call to his Ryerson Steel Specialist brought a suggested change to Ryerson welding and forming plate—a prompt solution to a costly problem.

Even in "plain carbon steel" applications, there's usually only one steel that's *exactly right* for each job. Nationwide, daily experience with a wide range of material selection and fabricating problems puts your Ryerson Specialist in the best position to know what is exactly right for *your* job. Backed by complete and diversified stocks, Ryerson can best supply that exact specification fast!

Let us help you make sure you get optimum value for your steel-buying dollars on every order—call Ryerson today.

METALOGICS

STEEL • ALUMINUM • PLASTICS • METALWORKING MACHINERY

RYERSON STEEL®

Joseph T. Ryerson & Son, Inc., Member of the INLAND® Steel Family

PLANT SERVICE CENTERS: BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HOUSTON • INDIANAPOLIS
LOS ANGELES • MILWAUKEE • NEW YORK • PHILADELPHIA • PITTSBURGH • ST. LOUIS • SAN FRANCISCO • SEATTLE • SPOKANE • WALLINGFORD

Close Control of Quality— a Nuclear Age Necessity

HAROLD W. BREDIN
Associate Editor

Initial experience in the production of nuclear power systems and missiles has led the Thermal Products Division of ALCO Products, Inc. to adopt a progressive inception-to-completion quality-control program. Personnel, numbering as high as one out of five in certain departments, include engineers to administer quality-control procedures which incorporate both engineering and statistical techniques. The benefits: improved methods of production and inspection; elimination of many causes of part rejection and repair; but most important, adherence to the exacting requirements for nuclear power plant equipment and missile manufacture

Close Control of Quality—

NUCLEAR POWER plant and missile component specifications can only be met by effective quality control. Well aware of this need, the management of the Thermal Products Division of ALCO Products, Inc., Dunkirk, N. Y., organized a quality-control department based on the fundamental concept that its program should influence all phases of manufacture from inception or contract inquiry stage and continue to the delivery of the finished product. That this program has been successful is evidenced by the fact that

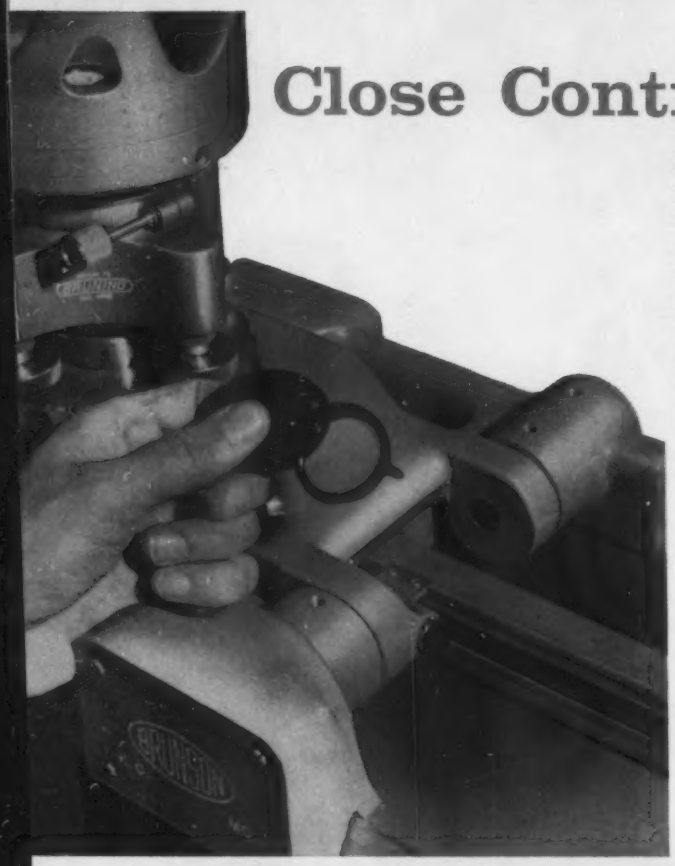
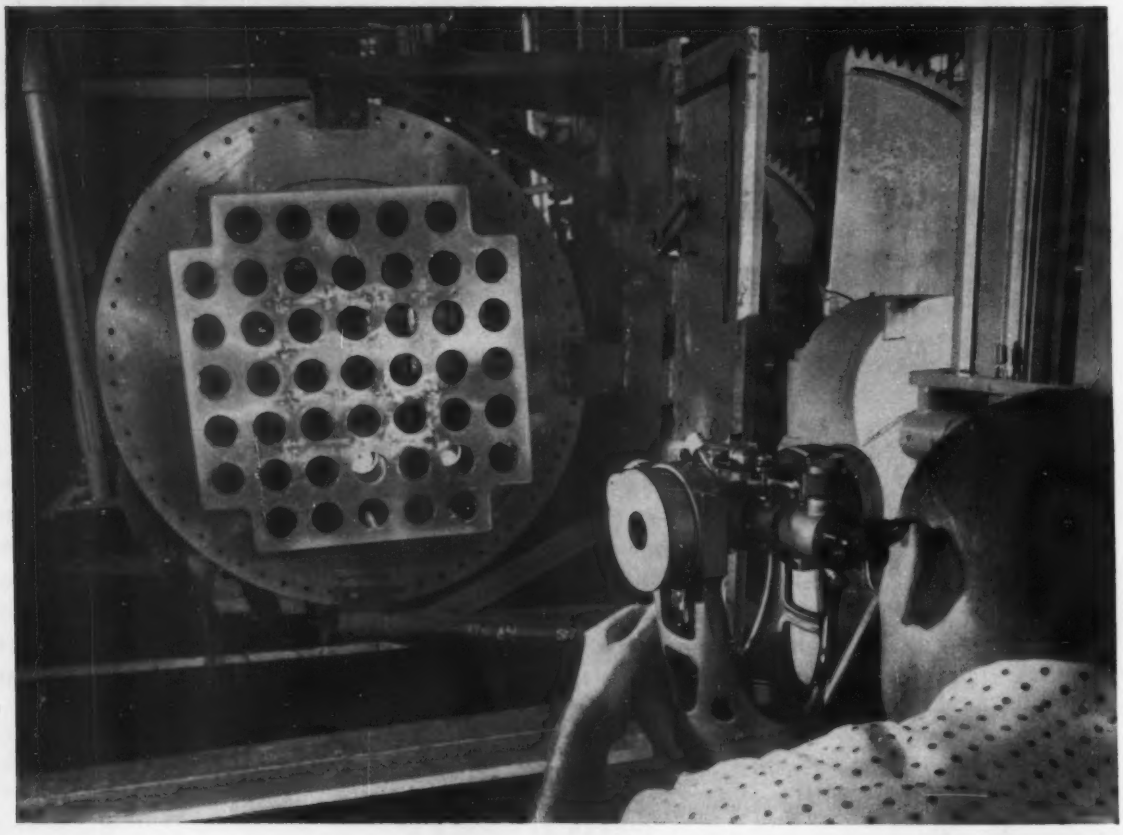


Fig. 1. (Below) Here, the bottom plate of the reactor core for a nuclear-powered vessel is being checked in the shop with optical tooling equipment. Operator is sighting through a jig transit which is carriage-mounted on a vertical tooling bar (right).

Fig. 2. (Left) This scale and vernier are used to determine the position of the instrument carriage and thus also the optical line-of-sight of the jig transit in relation to the master tooling bar. The vernier is mounted on the instrument carriage and the scale on the master tooling bar.



the plant has built equipment for over 90 per cent of all of this country's nuclear power projects.

The program is administered by a quality-control manager who reports directly to the general manager of the division. In addition to the inspection and nondestructive testing groups which usually constitute a quality-control department, the staff is implemented by an engineering group. This latter group has, among other duties, the responsibility of developing and analyzing data for evaluating the effectiveness of the program.

Even before an order is placed with the company, members of the quality-control department review specifications for practicability, intent, and quality requirements, and determine the necessary equipment, tools, and gages for inspecting the proposed work. After an order is received they review the specifications to determine the ability of material suppliers to adhere to them. They also designate the inspection procedures to be employed during manufacture, requisition the necessary tools and gages to execute these procedures, and prepare forms to insure that they are effectively carried out. These are only a few of their preproduction duties.

During production, incoming materials are inspected for physical dimensions and properties. Metallurgical analysis and other tests are also made. Materials are only released to the shop after being inspected and properly identified.

In-process inspections are an important phase of the quality-control program. Forms called "in-process travelers," which accompany work through the shop, list all in-process inspections to be made. Quality-control department personnel have the responsibility of making sure that these forms, which are checked periodically, are initialed and dated to indicate when inspection at each check point has been completed.

Fig. 3. Jig transit (left), mounted on a horizontal optical tooling bar, is being used to inspect a nuclear-reactor core barrel. (The barrel is set up on a vertical boring mill inside the plastic enclosure at the right.) Alignment scope in background is used to establish an optical reference line.

Fig. 4. A typical in-the-shop application of optical tooling. Alignment scope (left foreground) and the jig transit on the tooling bar are being used to establish an optical reference line for setting up this core-barrel component for machining. Jig transit on stand (left background) is based on this line for checking the alignment.

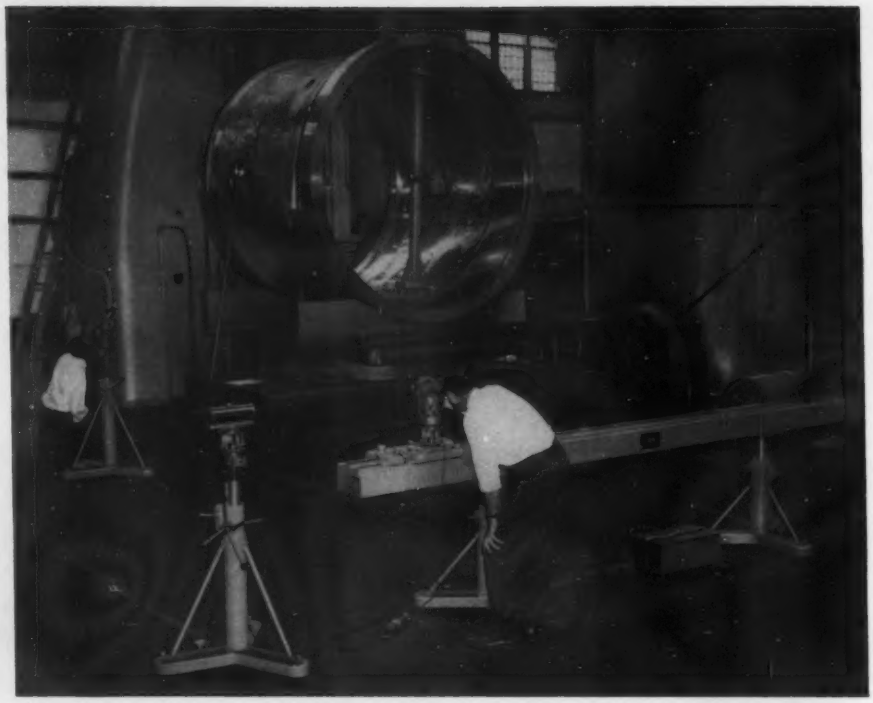


Fig. 5. Here, a reactor core barrel is inspected in a special optical tooling setup located in a constant-temperature room. Jig transit at left is in position for checking a locating hole on the work-piece in relation to the vertical axis of the barrel while transit in center of barrel is being used to determine the angular position of keyways.

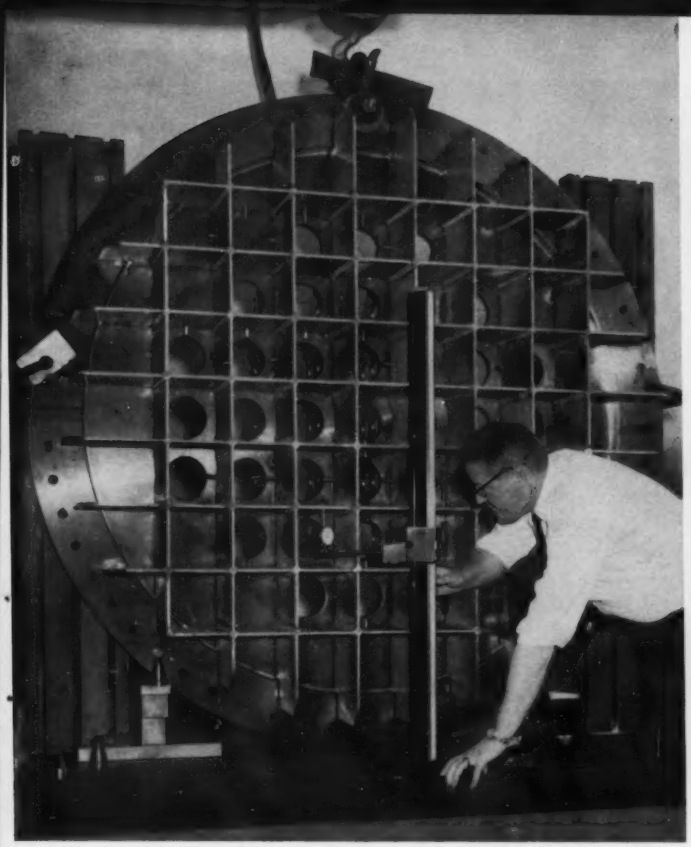


Fig. 6. Inspecting the "egg-crate" grid of a bottom plate for a nuclear reactor core with a height gage. This part, which has many close-tolerance dimensions, is resting on an 8- by 10-foot black granite surface plate, flat within 0.0001 inch per foot.

Fig. 7. Ultrasonic flaw detectors provide a rapid means of checking parts such as this for subsurface faults. Search probe in hand of operator emits and picks up reflected ultrasonic vibrations. Pattern on cathode-ray tube shows flaw size, depth, and location.

Optical Tooling Handy for on-the-Machine Inspection of Large Parts

Nuclear power plant components often require inspection for proper dimensions, layout, and orientation while set up in a machine. One tool that has come into wide use for in-process as well as for final inspections is the Brunson optical jig transit shown in the heading illustration. In Fig. 1 a quality-control engineer is seen checking the location of the center line of a hole in the bottom plate of the reactor core for a nuclear-powered vessel. The jig transit is being used in conjunction with a vertical optical tooling bar and the tolerance on the center line of the hole being checked is 0.002 inch. The optical tooling equipment is approximately 20 feet from the part.

Optical tooling bars are mounted either horizontally or vertically and have a master bar which is anchored positively at one end. This permits the master bar to expand or contract according to its coefficient of expansion independently of the tooling bar. For accuracy, the master tooling bar must be composed of a material that will have the same coefficient of expansion as the work being measured. Then, if the tooling bar and the work are kept at the same temperature, no error is introduced into the measurements by unequal thermal expansion of two materials.

The master bar has jig-bored holes with hardened steel bushings that are spaced at 10-inch intervals along its entire 15-foot length. Measurements are made by means of a 10-inch precision scale having mounting pins which can be positioned in any two holes in the master bar. The jig transit, an improved precision version of a surveyor's transit, is mounted on a two-section instrument carriage. One section is clamped to the tooling bar while the other is moved along the bar by a fine-lead adjusting screw. A vernier attached to the movable member allows an accurate check of the jig transit's position to 0.001

inch. A close-up view of the 10-inch scale mounted on the tooling bar and the vernier scale attached to the instrument carriage is shown in Fig. 2.

To check a dimension, the cross hairs (reticle) in the jig-transit eyepiece are aligned with the edge of a reference surface and then the jig transit is moved along the tooling bar until the cross hair lines up with the machined surface to which the measurement is to be made. The difference in the two positions of the jig-transit carriage as read on the tooling-bar scale is the required measurement.

On the horizontal axis of the jig transit at each side of the instrument, an optically flat, front surface mirror is mounted exactly parallel to the telescope's line-of-sight. This permits the use of auto-collimation for determining a precise right-angle plane to an optical reference line established by an alignment scope. Optical tooling equipment can establish right-angle reference lines to an accuracy of 0.003 inch at 100 feet.

An alignment scope (rear) and a jig transit (left) mounted on a 15-foot tooling bar are seen in Fig. 3. They are being used in the shop for checking a nuclear reactor core barrel (not shown). The core barrel is set up on the table of a Hypro boring mill which is in a plastic enclosure.

Fig. 8. Handy, portable X-ray equipment which can penetrate steel up to 5/8 inch thick is seen here being set up to radiograph a nozzle. Input to this 140,000-volt machine is 110 volts A.C.

In the early stages of machining this core barrel, four air conditioners were installed in the enclosure. This allowed the temperature of both the measuring equipment and the work to be maintained at the same and constant value (68 degrees F. ± 2 degrees) during the taking of measurements. In Fig. 4, a core-barrel component is being set up for machining on a Giddings & Lewis horizontal boring mill with the aid of optical tooling.

The alignment scope at the left of the tooling bar has been used to establish a reference line parallel to the base of the core barrel, and the jig transit on the bar has been used to establish a reference line perpendicular to the first reference line. A second jig transit (left) is being positioned from the second reference line and used to verify the alignment of the core barrel on the machine. Typical in-the-shop applications of this equipment are the checking of layouts, the transferring of center lines, and the checking of setups without disturbing them.

Optical Tooling Bars Arranged in a Three-Coordinate Setup

Of course, optical tooling is not only used for on-the-spot shop inspections but also in a constant-temperature room for both intermediate and final inspections. A typical setup for checking nuclear power plant components in the more ideal environment of the constant-temperature room is illustrated in Fig. 5. There, three optical tooling bars are used, one mounted in each of the three principle planes. Each of the two horizontal tooling bars with its jig transit and separately mounted alignment scope is supported on special stands at a level that permits checking of tall work-pieces. A raised platform is provided for the inspectors.

The vertical tooling bar is not in use but can be seen near the wall at the left of the illustration. This bar is identical to the other two bars except that the instrument carriage is counterbalanced and supports the jig transit parallel to the bar (in a vertical position).

In Fig. 5, the inspector at the left is checking the position of a locating hole in a reactor core barrel for alignment with the vertical axis of the part. In addition, the angular location of keyways in the component are being checked by means of a transit supported on a yoke and located on the vertical axis of the barrel. Linear measurements can be made by optical tooling to within 0.001 inch. Results are checked three times to insure accuracy.

The constant-temperature room is also used for other close-tolerance inspection. The "egg-

Fig. 9. Setting up to X-ray a longitudinal seam weld in a Pershing missile case. Angle head of a two-headed, 300,000-volt machine is in operating position. The other (360-degree) head is useful for girth welds.

Fig. 10. X-ray film is developed and dried by this completely automatic processing machine in thirteen minutes. Often the results of a radiographic test are known in less than a half hour. Three hundred to six hundred pieces of film are processed daily.

crate" grid construction of a stainless-steel bottom plate for a reactor core is seen in Fig. 6 being checked in this room with a height gage. The plate, partially supported by an overhead crane, is on an 8- by 10-foot black granite surface plate that is flat within 0.0001 inch per foot.

Nondestructive testing has become an important feature of the quality-control program. One unique tool which permits rapid check of materials such as stainless-clad steels, tube and pipe, and rolled-steel plate and sheet for flaws is the ultrasonic flaw detector. In using this device, a search probe which emits ultrasonic vibrations is brought into contact with a material that has been wetted by a coupling medium such as SAE 30 engine oil or glycerine.

As the search probe is passed over the material, reflections of the ultrasonic vibrations from the opposite side of the material and subsurface flaws are picked up and recorded on a cathode-ray tube. From the pattern on the cathode-ray tube both the size and the depth of a flaw can be determined.

Where practical, work-pieces are located in a lathe or on a rotary table to facilitate rapid 100 per cent inspection. Calibration notches or holes are employed to insure that the readings are interpreted properly. Either a longitudinal or a shear (45-degree angle) wave-producing

crystal is used, according to the requirements of the particular test. In Fig. 7, an inspector is shown using a Sperry Reflectoscope, an ultrasonic flaw detector, to search a Pershing missile motor case for imperfections below the surface of the metal.

In addition to the ultrasonic method, other nondestructive tests used include dye penetrants for discovering surface faults and magnetic-particle inspection for finding flaws both at the surface and up to 3/8 inch below. An alternating magnetizing current is used for surface magnetic-particle inspection and a direct current for discovering subsurface faults.

Welding Given 100 Per Cent Radiographic Inspection

Due to the unusually high quality of joints required for thermal, nuclear, and missile components built at the plant, 100 per cent radiographic inspection of all welding is done. The X-ray equipment employed ranges from a 140,000-volt portable unit capable of radiographing materials up to 5/8 inch thick to a 1,000,000-volt machine that can penetrate 7 inches of steel. The 1,000,000-volt X-ray machine is suspended in a large concrete-block room with lead-lined doors and operating cubicle.

The portable machine can be operated from any 110-volt A.C. outlet, a small area of the shop being roped off when it is in use. An X-ray technician is seen in Fig. 8 setting up the portable equipment for radiographing a nozzle on a large power plant component.

One of the X-ray machines is equipped with two heads, each capable of penetrating up to 3 inches of steel. An angle head facilitates radiographing of long longitudinal welds while the other is designed to X-ray 360-degree circumferential or girth welds. In Fig. 9 a longitudinal weld in a Pershing missile case is about to be radiographed using the 300,000-volt machine and the angle head. On all X-ray work, a penetrameter with a 0.010-inch hole is used to verify penetration and double-film technique is employed on all nuclear equipment.

To speed radiographic inspection, X-ray film is developed in a Kodak X-Omat continuous film-processing machine (Fig. 10). This equipment is fully automatic even to the extent that bath chemicals and temperature are self-maintained. The processor will completely develop and dry X-ray film in thirteen minutes. The average time for a complete radiographic test is between thirty minutes and an hour. Previously, a hand processing setup was employed and several hours were required to obtain the result of an X-ray inspection. Now the radiographic report is often delivered before the work-piece has been removed from the X-ray setup. Thus, if any additional radiographing is required, it may often be done without extra handling of the part.

Another advantage of the machine is that long strips of film can be readily developed. In addition, faulty film processing which can cast doubt on the value of a radiograph has been eliminated. Savings in time and labor due to the reduction in the number of retakes have been high. The quantity of film processed in an eight-hour day normally varies between 300 and 600 pieces.

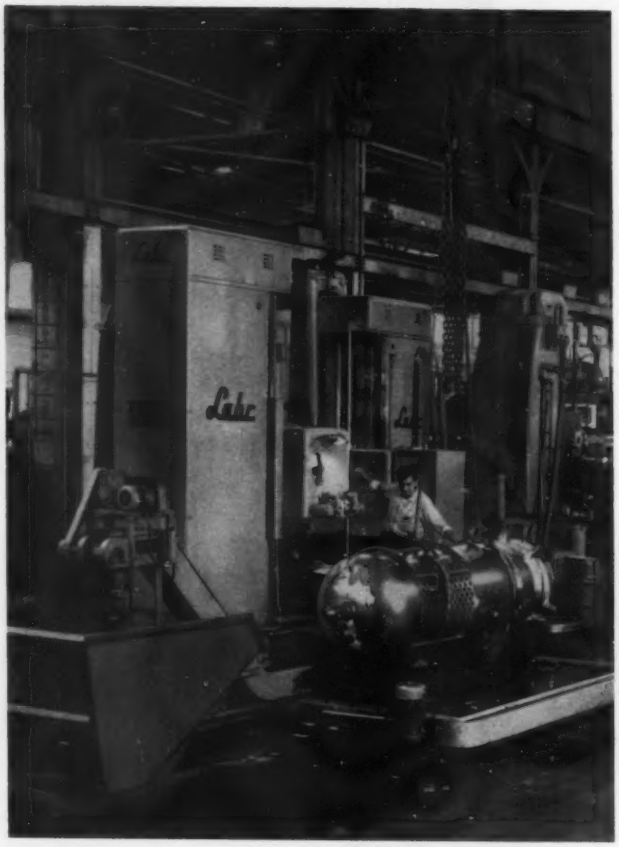


Fig. 11. Here, a large power-plant component is being positioned on one of two tape-controlled deep-hole drilling machines. A single operator runs both machines. Tube-sheets can be stacked and accurately drilled on this equipment.

Reports of X-ray retakes and repairs of various types are collected and the incidence of repairs is graphically recorded and statistically studied by the quality-control engineering staff. When the repairs become excessive, the cause is investigated.

In one instance this led to an unusual discovery. Welding on emergency coolers for a submarine nuclear propulsion system had a large number of "defects" requiring repair in the root passes.

When the repairs were plotted on the graphical record, the quality-control department was alerted. An investigation by quality-control engineers resulted in the making of destructive tests, chemical analysis, and microscopic inspection of welds on test pieces made of the same Monel alloy as the cooler. These proved the welds to actually be reliable. The "defects" were an unusual shadow on the X-ray film caused by the metallurgical structure of the material in the root pass. As a result, a specification change was agreed to by the customer. This is one example of how effective quality control can reduce costs by tracking down the causes of failure to meet specifications. When a cause is not readily detected, a graphical record of repairs can sometimes, over a period of time, lead to its discovery.

In the shop, the choice of a machine tool can often have an influence on the quality of a product. For example, the adoption of tape-controlled deep-hole drilling has significantly improved the accuracy of tubesheets made at the plant. Two Lahr deep-hole drilling machines (Fig. 11), each directed by Warner & Swasey Tele-Probomat control systems, are employed for these operations.

Control tapes are prepared from design data with the aid of an IBM computer in a card-to-tape procedure. The machine head automatically indexes and drills the holes according to a tape program. An electric-eye arrangement designed by ALCO checks both the vertical and horizontal position of the drill head before each hole is drilled. Stroke, feed, and speed of the spindle are preset. In addition, spindle speeds and feeds can be made to vary within each stroke according to the material being drilled. The machine has a 24-inch maximum stroke and can drill holes up to 1 1/4 inches in diameter.

Once the tape is prepared, errors due to human failings are largely eliminated. Tubesheets are often stacked to increase production. A single operator can run both machines. One stainless-steel clad tubesheet that required 438 1 1/8-inch-diameter holes was completed in seventy-two hours, including machine setup time. Previously, about 328 hours would have been required to drill this part.

To better control the quality of missile components, the company has recently installed a vertical Lindberg electric heat-treat furnace (Fig. 12) for controlled-atmosphere hardening.

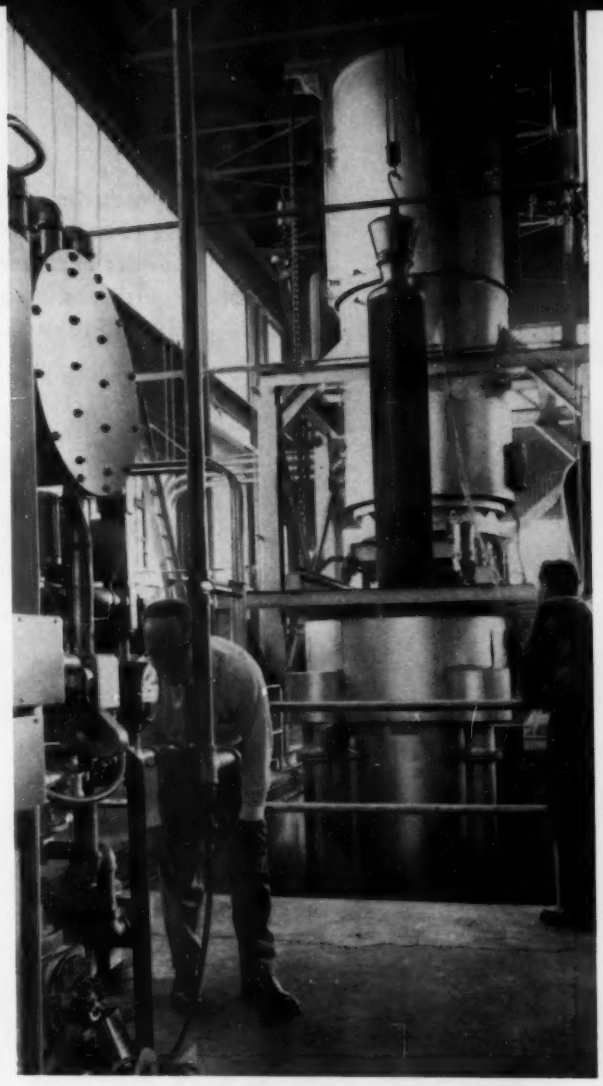


Fig. 12. Missile rocket chamber being removed from the quench tank of the vertical electric heat-treating furnace (rear). Parts enter and leave the furnace through a door in the bottom.

This furnace, which can accept parts up to 44 inches in diameter and 165 inches long, is stationary and the cooling equipment and loading station move beneath it on a quench car. Parts enter and leave the furnace through a door in the bottom. An endothermic atmosphere is provided in the furnace by a generator that can be automatically controlled to maintain equilibrium with any steel.

The air-gas ratio is automatically governed to produce a constant dew point, and instruments continuously record furnace conditions during each heat. This installation includes an oil quench tank and a vertical gas-fired tempering furnace. The maximum tempering temperature is 1250 degrees F.

Volume production of press brakes and bending tools has justified the purchase of over $2,000,000 in new machine tools by a machine tool builder at a time when most metalworking plants were cutting back acquisitions in capital equipment. To go into volume production of brake dies has meant doing "the impossible" in carbide tooling on the new planers to keep prices down

Fig. 1. Tongue machining of tool-steel bars for press-brake dies has two tool-heads with bed fixturing for handling parts in tandem. Four dies are formed at once.

"IMPOSSIBLE" TOOLS MAKE DIES ON PRODUCTION

MAKING TOOLS and DIES on a production basis is a rarity. It calls for unusual demand. Dreis & Krump Mfg. Co., Chicago, Ill., to satisfy the demand for press-brake dies, has developed unusual production methods for planing and heat-treating brake dies to keep up with its sales. In the last eighteen months the company has replaced a large proportion of its machine tools.

Planers, heat-treating equipment, and other capital items have been installed with value in excess of $2,000,000. Obsolete machine tools have been replaced so that today Dreis & Krump has a truly modern plant, with more floor space still being added.

To machine the heavy bars of die steel for press-brake dies has required persistence in developing cost-cutting carbide tooling. As is customary, the greatest savings have come as a result of going ahead and doing jobs that "couldn't be done." Carbides, of both throw-away

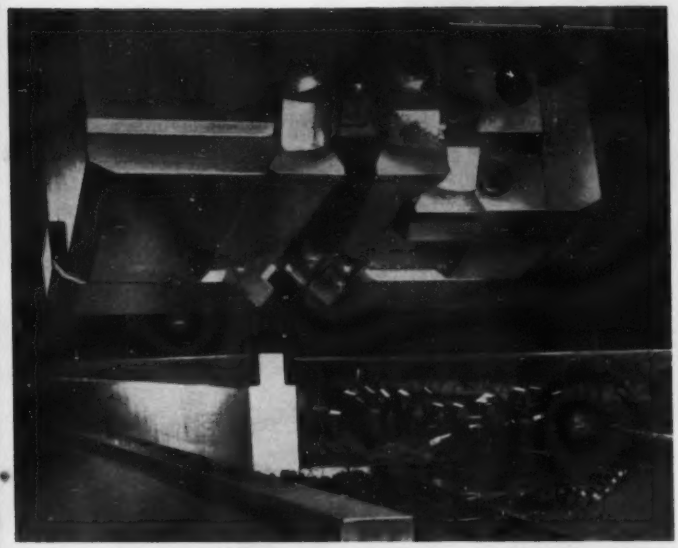


Fig. 2. Close-up view of tongue-cutting tool-head shows the four shouldering bits (above) and the four chamfering cutters to the rear in the clusters. Finish is improved by making the last few strokes without feed.

$M_M T = pE$

LAURENCE W. COLLINS, Jr.
Associate Editor

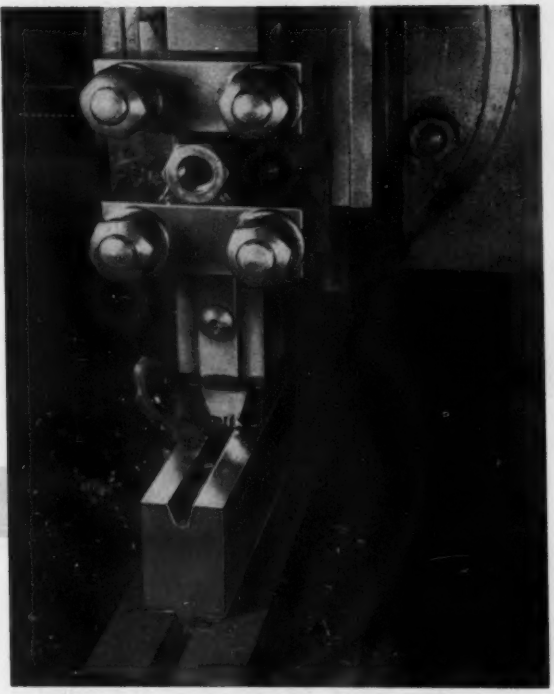


Fig. 3. Plunge-cut groove in brake die has 34-degree included angle. Feed is 0.012 inch per stroke at 200 surface feet with this throw-away bit, at neutral rake.

BASIS

and brazed types, figure importantly. Here are a few examples of the cost-saving tooling that has resulted. The success has been a joint effort achieved in cooperation with a field engineer of the supplier of carbides.

Outstanding in performance is the tooling on a large double-housing planer, Fig. 1, which machines the tongues by which the dies are clamped into the press-brake ram or bed. This machine has a 20-foot table travel, 36-inch-wide table, and two rail heads. The table has twin vises that permit holding work beneath both heads at once. Stroke is long enough to plane two 10-foot bars end-to-end, or an 8- and a 12-foot bar in tandem on each side at once.

The work-piece material is customarily C 1144 tool steel 1 3/4 inches thick, although Amalgamated Steel Co.'s Diekrome is sometimes ordered as a special. Side faces are ground. Each of the cutter-heads, Fig. 2, has eight Valenite

Fig. 4. Open-side planer grooves two brake dies end-to-end at "hogging" rates in tool steel using throw-away carbide cutters, despite interrupted cuts, and rapid feed.

VC-125 carbide throw-away inserts. Most of the cutting is done by a pair of shouldering cutters with an added shouldering tool offset two inches behind the face to add width to the cut when tonguing an occasional 2 1/2-inch-thick work-piece. The central upper bit comes into play only at the end of the cut when it cleans up the top of the tongue to the specified dimension.

All of these shouldering cutters are standard 3/4-inch inscribed circle triangular throw-aways purchased as a modified standard with flat lands ground on corners.

At the rear of the cutter-head is a second cluster of four more chamfering cutters. The two lower cutters bevel the shoulder-to-side corner, cutting continuously. The position of these tool-holders can be adjusted on the head when working the 2 1/2-inch thick bars.

Two more cutters in this cluster come into play, chamfering the top-to-shank angles of the tongue during the last few strokes of the planer. On C 1144 steel, the table moves at 200 sfpm (surface feet per minute) with a 0.015-inch feed per stroke. This same feed is used making tongues from Diekrome; however, speed is cut back to 150 sfpm. The Valenite VC-125 carbide tool material conforms to C-50 carbide in the industry standard. All tool-holders have VC-10 carbide shims conforming to the C-10 industry standard.

While the die tongues are standard, the work faces of the die bars are machined in a wide variety of standard and special cross sections. A number of planer tools were developed that enable these cuts to be completed in reduced time.

One example is the tool for a groove having a 34-degree included angle, Fig. 3. With the VC-125 carbide throw-away insert in an open-side planer, Fig. 4, this groove is plunge-cut from the solid to a depth of 1 3/8 inches. The insert is reversible in the holder. Table travel with a C 1144 work-piece is 200 feet per minute, 150 feet on Diekrome. The ends of the work-pieces are not squared, so that when two work-pieces are set up end-to-end and grooved, there is often a gap between them. The result is an interrupted cut which was the source of cutter chipping. Use of a neutral rake helped tool life but it was the carbide material selection itself that ultimately proved decisive.

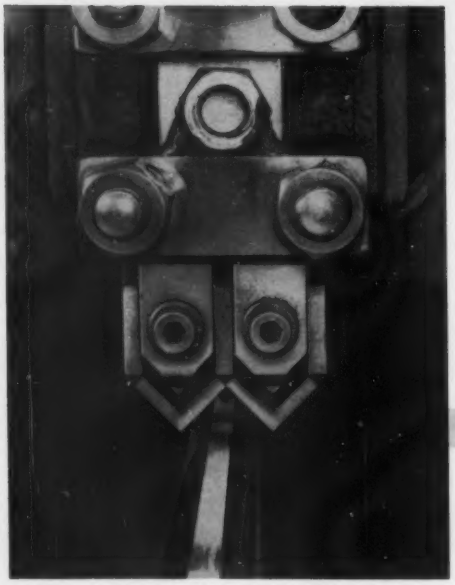


Fig. 5. V-form is cut in a press-brake punch by a special throw-away tool-holder which uses two large, square carbide bits clamped on the corners.

Another example of tooling that "couldn't be done" is the case of a double-insert tool-holder, Fig. 5, that produces a 90-degree form on a "punch." The holder clamps two 1 3/16-inch-square special carbide throw-away inserts in a position to straddle the cut. Valenite VC-125 carbide inserts with special chip-breakers and VC-10 shims are used. Here the problem of cut-

Fig. 6. Induction heater traverse for brake dies is a 20-foot planer table riding on a 44-foot bed made by bolting two beds end-to-end.

ter chipping was unusually pronounced, especially on interrupted cuts resulting when die bars were machined end-to-end. Valenite VC-125 is used with a 0.012-inch feed at 200 sfpm.

After the die bars have been completely machined the work surfaces are selectively hardened to Rockwell C 48-52 on one of the company's two induction hardening machines. The machined die bars are clamped in a traversing carriage with the work surfaces presented to the inductance coil. Fourteen years ago Dreis & Krump built its own carriage and bed for this work. Production has been supplemented by a new installation, Fig. 6, as a part of the recent expansion program. The new high-frequency power supply is a General Electric 50-kw unit.

The new work-traversing equipment is novel in that it is a 20-foot planer table running on a 44-foot bed made by bolting together two 22-foot planer beds end-to-end. Because traverse speed is slower than planers require, a special drive was built. The drive, bed, and table were furnished by the Rockford Machine Tool Co. Table-travel speed is controlled electronically to insure uniform case depth for the full length of the die. To save time two of these dies are often hardened end-to-end in one pass.

Fig. 7. Carbide cutter on a home-built swivel toolpost generates a sphere for a ball joint. Operator's left hand turns feed-screw knob.

Other sections of the plant are devoted to building press brakes. A distinctive feature of the "Chicago" design is the ball-in-socket connection of the ram to the pitman whether the brake is hydraulic or mechanical. The balls and the mating-socket hemisphere contours are generated by a company-built swivel toolpost that is substituted for the regular saddle, Fig. 7. This novel device drives from a gear train to the cross-slide screw and swings the V-nose, brazed carbide cutter through 180 degrees of arc. Because the tip is V-ground, a cut can be made regardless of swing direction. The cutter bit is again Valenite VC-125 carbide. Turning radius is controlled from 0 to 3 3/4 inches at the toolpost by an adjustable slide over the swivel.

The machine tool is a Lehman Hydratrol lathe. Spindle rotation is 195 rpm. The same tool swivel is used in making the mating sockets for the pitman spheres, with the socket parts chucked in a special fixture on a faceplate.

CHARLES H. WICK

Carbide Coating Boosts Life of HIGH-SPEED-STEEL TOOLS

Where the cost, application, or other factors rule out the use of solid-carbide tools, carbide-surfaced high-speed-steel tools may be the answer.

THE RESILIENT TOUGHNESS of high-speed-steel cutting tools is still preferable to the combined wear resistance and hardness of carbides for some production machining operations. However, in applications subject to heavy wear, the short life of high-speed-steel tools offsets the advantages of greater toughness, lower initial cost, and easier regrinding. One compromise now being used successfully by several metalworking firms is to coat the cutting edges of high-speed-steel tools with carbide particles. In this way, the superior wearing qualities of carbide are achieved while the shock resistance of high-speed steel is retained.

Spark deposition of carbide on high-speed-steel cutting tools can be done with "Sparcard" machines developed by Impregnated Diamond Products, Ltd., Gloucester, England, and distributed in the United States by Easco Products, Ypsilanti, Mich. One of these spark carbide-deposition machines, seen in the heading illustration, is installed in the cutter grinding department of the Trenton, Mich., engine plant of Chrysler Corporation.

With these machines, material from a carbide electrode is transferred to the cutting tool. The electrical circuit of the Sparcard machine is very similar to that employed on spark-machining equipment made by the same company—the principal difference being that the Sparcard machine is equipped with a vibrator instead of the usual servo feed in the head. Transformer and power supply are mounted in the base, while the condensers and output side of the circuit are in the head of the machine. The head is also equipped with a voltmeter, an ammeter, and switches for controlling the spark discharge.

Coarse adjustment of the carbide electrode, which is clamped to the vibrator mounted beneath the head, is accomplished with a handwheel, and fine adjustment, with a micrometer control. A handwheel-actuated compound slide is mounted on the T-slotted surface of the machine base. The cutting tools to be coated are cleaned to remove any dirt, oil, or grease. Then they are secured in a universal holder having an adjustable base with hinged platform, a swivel table, cross-slide, and tilting head. This arrangement permits setting single-point tools, reamers, milling cutters, or other types of tools at any compound angle desired so that the surfaces to be coated are horizontal. The machine head can be swung aside on its column to facilitate setting up the work, and locked in operating position.

In operation, the electrode is brought into close proximity with the surface to be coated, Fig. 1, and the current turned on. A spark discharge occurs across the small air gap between the vibrating electrode and the work. The work is traversed beneath the electrode, and several passes are made to complete the coating.

Spark discharge is regulated by means of a rheostat, with reference to the ammeter and voltmeter, so that a constant condition is maintained. For fine deposition, a setting of 115 to 120 volts, 0.1 to 0.5 amperes, and 4 to 16 microfarads is used. For coarser deposition, a setting of 90 to

Fig. 1. In coating high-speed-steel tool with carbide, a spark discharge occurs across the air gap between electrode and work.

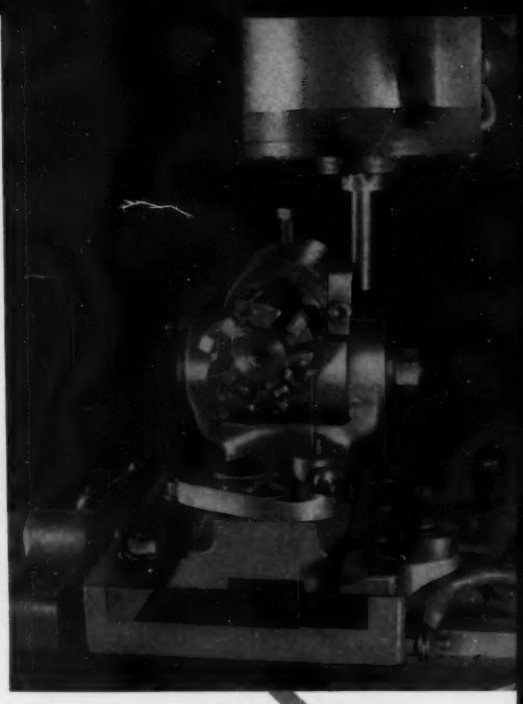


Fig. 2. Setup employed for carbide coating the inserted blades of a milling cutter. One square inch can be coated in ten minutes.

Many metalworking manufacturers are realizing substantial savings with such tools due to the longer life between grinds and reduced sharpening costs

115 volts, 0.8 to 1.2 amperes, and 116 microfarads is employed. Different grades of carbide can be applied, depending on the material to be machined.

Treatment is applied to those surfaces of the tool which will be subject to the greatest wear, and usually to the top rake surface to prevent erosion by the chips. The vibrator is fitted with a self-compensating mechanism which will automatically correct the setting in case of slight irregularities in the surface of the tool being treated.

The spark-deposited carbide surface is not a continuous coating, but a series of tiny spheres and shallow craters lined with tungsten carbide. As a result of such deposition the coating will not strip, flake, or dust unless it is applied excessively thick. In general, a carbide coating 0.0004 to 0.0005 inch thick is adequate, but a thickness of 0.0008 inch or more can be applied in several passes. A thickness of 0.0004 inch can be applied at the rate of about ten minutes per square inch of surface.

The satiny finish of the coating is typical of that produced by spark machining. Coated-surface tools are used without subsequent finishing. Visual inspection of the coating is generally satisfactory, although an indicator can be used to check the thickness. In cross section, the coated surface has a top layer of carbide, a hard subsurface resulting from the hardening effect of the process, a softer zone, and the parent metal at the bottom. Surface hardness of the work-pieces is increased as much as 25 points Rockwell C, resulting in an average hardness of about 85 Rockwell C. However, the conventional grinding wheels and techniques used for high-speed steel can be employed for sharpening.

Improvements in the life of high-speed-steel cutting tools coated with carbide have been as high as 400 per cent, but the minimum for any practical application has been closer to 50 per cent. The actual increase in life attained depends on the nature or hardness of the particular tool being treated, the geometry to which the tool is ground, the rigidity of the machine on which the tools are to be used, the type of material being cut, and the cutting speed and feed employed. One of the best ways of evaluating tool life is to measure the rate at which wear lands are developed on the cutting tools.

In addition to the increase in life between sharpenings, carbide-coated tools generally require less stock removal during sharpening because the wear lands develop less rapidly. Also, the longer life results in fewer tool changes and less job setting. In some applications, coated cutters have given good results in machining dieblocks and Meehanite iron, where the performance of uncoated high-speed-steel tools was only moderately satisfactory. In one instance, a high-speed-steel step reamer was salvaged by coating the periphery and top rake surfaces to increase the diameter 0.001 inch.

In general, it has been found more advantageous to deposit carbide on roughing tools rather than finishing tools because of increased savings.

Also, it is much easier to apply the coating to flat surfaces such as those found on single-point tools, reamers, and plain milling cutters. The application of carbide to the inserted blades of a milling cutter is illustrated in Fig. 2. Special attachments are available for the more difficult setup of applying the coating to curved or compound surfaces on twist drills, form tools, and special cutters. However, the process has been applied successfully to such tools without using special fixtures. For example, one company attained an increase in tool life of 421 per cent by coating the periphery and flute edges of high-speed-steel drills used in machining cast iron. Yet, in other applications, the improvement in tool life may not be enough to justify carbide coating, because of the time required for surfacing and the fact that the entire coating may have to be removed during regrinding.

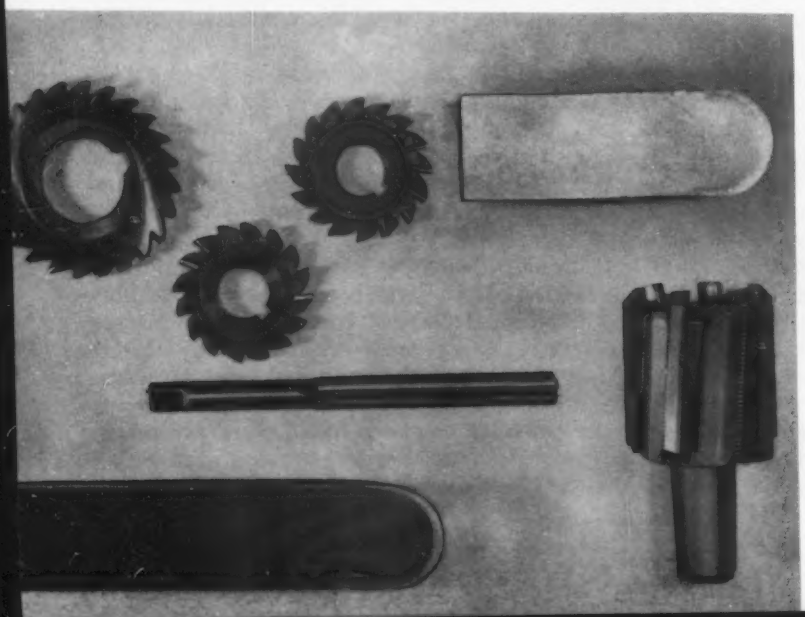
While developed primarily for application to cutting tools, the process can also be employed to increase the wear resistance of a variety of parts. For example, it has been used to substantially increase the life of piercing punches and cold-header trim dies. However, the process has been found only moderately successful for plug gages, ring gages, and similar parts because of the comparatively rough surfaces resulting from application of the coatings.

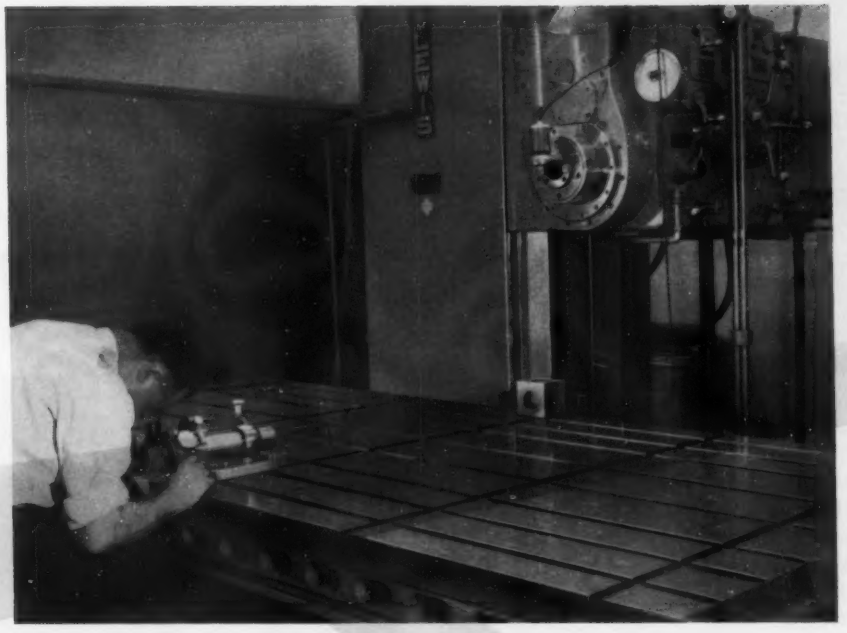
Some of the various high-speed-steel tools currently being coated with carbide at the Chrysler Trenton plant are shown in Fig. 3. Initial tests conducted at this plant showed that the machine (heading illustration) paid for itself in two months. The results of these tests are given in the accompanying table.

Comparative Results Obtained with Various High-Speed-Steel Tools Before and After Coating with Carbide

Tool	Work-Piece	Number of Tools Required for Operation	Untreated Tools		Treated Tools				Increased Number of Parts Produced Per Tool
			Tool Life, Number of Parts Produced Before Sharpening	Number of Tool Changes Required Per Shift	Tool Life, Number of Parts Produced Before Sharpening	Increased Tool Life Per Cent	Number of Tool Changes Required Per Shift	Number of Tool Changes Saved Per Shift	
Facing Tool Bit	Plymouth 6-Cylinder Crankshaft	6	65	11.8	97.5	50	7.9	3.9	32.5
Keyway Cutter	Plymouth 6-Cylinder Crankshaft	2	300	2.6	975	225	0.8	1.8	675
Milling Cutter, Six-Blade Insert	Plymouth 6-Cylinder Connecting-rod	8	138	33.5	345	150	13.4	20.1	195
Countersink Form	Valiant 6-Cylinder Crankshaft	2	350	1.5	595	70	0.9	0.6	245

Fig. 3. Variety of high-speed-steel tools which have been coated with carbide on the spark deposition machine seen in heading illustration.





OPTICAL CHECK-OUT OF MACHINE TOOLS FOR MISSILE PRODUCTION

GEORGE W. DONALD
Facilities Administrator,
Advance Manufacturing Engineering Ordnance Dept.
General Electric Co.
Pittsfield, Mass.

MACHINE TOOL check-out and alignment to meet today's precision requirements in the field of missile and ordnance equipment manufacture has presented many problems. Squares, levels, straightedges, and indicators have been found inadequate and are sometimes awkward to handle. Cylindrical squares used in machine tool alignment are only as good as the surface on which they are mounted. Straightedges may sag and indicators commonly used on sweep-arms require pressure on the contact tip which will cause some deflection in addition to the natural deflection of the arm itself.

In checking out machine tools such as horizontal boring mills and jig-boring machines in the Ordnance Department of the General Electric Co., the practice is to first establish bedway flatness with optical instruments, as shown in Fig. 1. These instruments are either auto-collimators or alignment telescopes. Auto-collimators permit flatness to be checked within 0.000005 inch per inch. The alignment telescope used has built-in micrometer adjustments in both horizontal and vertical planes and permits readings accurately to 0.0002 inch at distances up to 15 feet. After bedway alignment has been checked and the table has been fitted in place with the table top parallel to the bedways, the table flatness is checked.

Table-flatness checking is accomplished with an auto-collimator, a corner mirror, and a mirror carriage, these instruments being seen in use in Fig. 2. Readings are taken on both diagonals, both ends, both sides, and at an intermediate

Fig. 1. Flatness of bedways on machine tools is checked with either an auto-collimator or an alignment telescope.

Fig. 2. Flatness of the table on a large boring mill being checked through the use of an auto-collimator, a corner mirror, and a mirror carriage.

spacing on large tables. The readings are plotted on graph paper and the resulting graphs give a topographical map of the table top in increments of 0.000025 inch for every 5 inches along the checking line. Machine tables 5 by 10 feet checked by this method have been scraped to a flatness of plus or minus 0.00025 inch in relation to a true plane.

Column squareness is checked with the alignment telescope, a stride level, a pentaprism, and a suitable target in the manner illustrated in Fig. 3. The stride level, accurate within 2 seconds of arc, is placed on an average flat area of the table, determined from the "topographical" map of the table top, and adjusted to a zero reading. The stride level is then mounted on the telescope, and the telescope is adjusted to obtain a line of sight parallel to the average flatness of the table. This line of sight is "bent" 90 degrees accurate in the pentaprism to 0.05 seconds of arc, to line up with a target that can be mounted on the column ways or head assembly of the machine. When the target is moved on the column, readings accurate to 0.0002 inch are taken which show any deviation from the desired straight-line travel. The column is adjusted or scraped to bring the machine to the accuracy required. This method of checking a jig borer permits observation of any deviation in the spindle travel as well as in the head travel.

Spindle drift on machine tools is easily checked with optical instruments, as shown in the heading illustration. The practice eliminates cut-and-try methods. A target placed on the center of the spindle axis is observed with the alignment telescope. This is done with the spindle running at the average operating speed. Readings in increments of 0.0002 inch are taken without stopping the spindle. The head temperature, room temperature, direction, and amount of drift are recorded on the more accurate machines over a two-hour period and used as a guide for warm-up time prior to machining accurate parts.

Straight-line travel of the spindle is checked with the same setup as is used in checking spindle drift. Precautions must be taken in positioning the telescope to make sure that the line of sight is parallel to both the table top and the bedways. Spindle runout can be observed and measured in 0.0002-inch increments by rotating the spindle slowly and measuring target runout.

The basic kit of optical alignment equipment in Fig. 4 includes, from left to right, an alignment telescope complete with a right-angle eyepiece and adjustable mounting fixture, an adjustable target holder, a magnetic base target holder, a pentaprism, a stride level, an auto-collimator, a mirror carriage, and a corner mirror. These basic items, used with some ingenuity, and special adapter for some applications, permit the check-

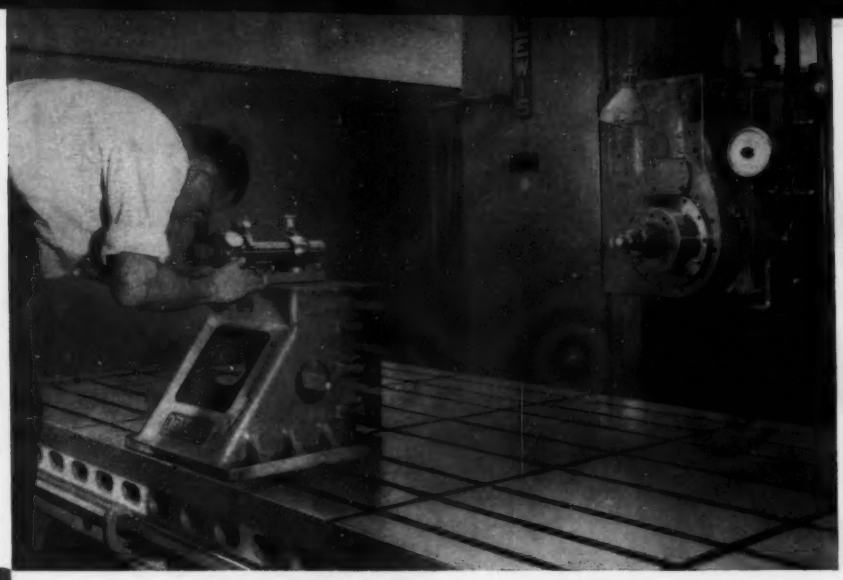


Fig. 3. Column squareness with table is here being determined by using an alignment telescope, a stride level, a pentaprism, and a target attached to spindle.

ing of most machine tools used to produce accurate parts.

Optical equipment is comparatively light, readily transported from place to place, easily checked and calibrated, very flexible in making varied setups on different machine tools, and reliable. Through the use of optical alignment equipment and working with machine tool builders, horizontal boring mills in the Ordnance Shop have 5- by 10-foot tables flat within 0.00025 inch, spindle assemblies that will not drift out of location more than plus or minus 0.0002 inch after a forty-minute warm-up at normal operating speeds, and columns square with machine tables so accurate that if the head is raised up to 6 feet it does not deviate from the 90-degree line of sight by more than plus or minus 0.0002 inch. It is believed that without optical equipment these measurements could not be taken accurately and close alignments of this type would not be possible.

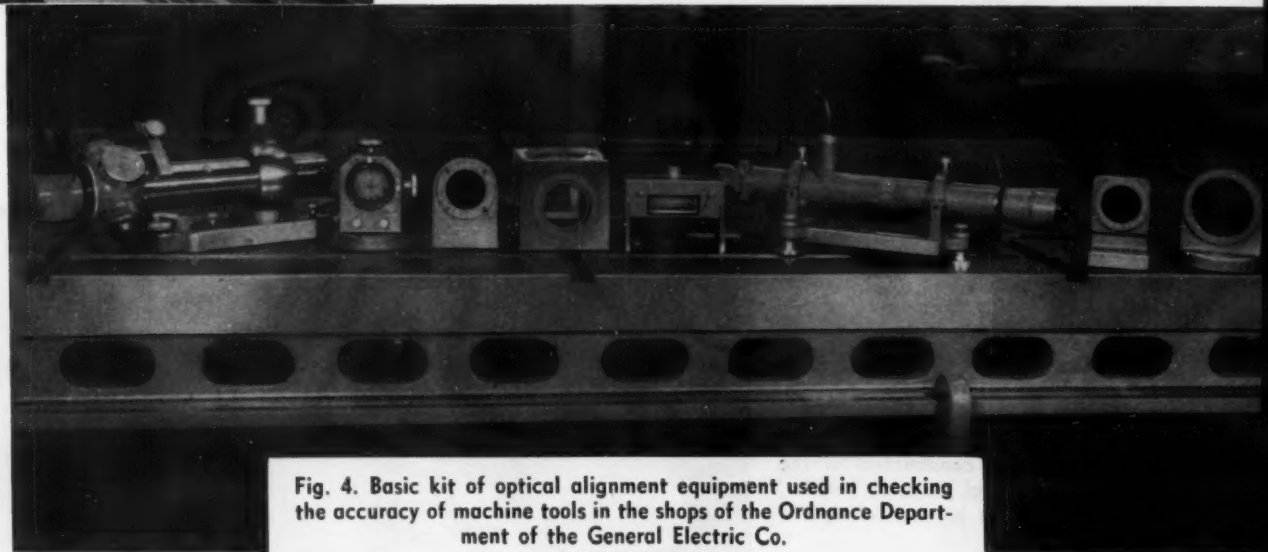


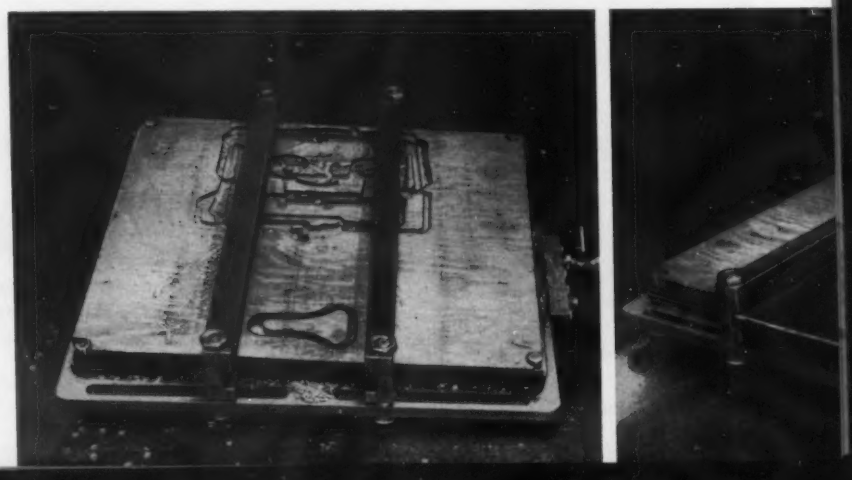
Fig. 4. Basic kit of optical alignment equipment used in checking the accuracy of machine tools in the shops of the Ordnance Department of the General Electric Co.

ROUTING FIXTURE BUILT AROUND RUBBER BAG

A SIMPLE AIR BLADDER is the heart of a company-developed work fixture that is speeding profile routing operations at Grumman Aircraft and Engineering Corporation, Bethpage, N. Y. On the top of the fixture, or router box, as it is called, are two guide channels against which the work strip is thrust upward. Fastened to the bottom is a template of the desired profile. During the operation, the box is guided under the router spindle, with the template kept in contact with a pilot that protrudes through the machine table.

All of the parts of the router box can be seen in Fig. 1. In addition to the two guide channels, it consists of a baseplate mounted on Teflon legs, a plywood routing board, and a rubber air bladder which is sandwiched between the baseplate and a metal plate under the routing board. A fitting on one edge of the baseplate connects the bag valve with an air hose. The clamping bars are strapped around the baseplate by bolts which run through slots, permitting the distance between the bars to be adjusted to the work strip.

In Fig. 2, a strip has been positioned in the box. The operator has opened the petcock, filling the bladder with air. A pressure of 5 psi is sufficient to raise the routing board and force the strip firmly against the undersides of the channels. It is now ready for routing.



1. The sandwich construction of the routing board, metal plate, air bladder, and baseplate can be seen along the edge of the box.

In setting up a job, the template is first attached to the bottom of the baseplate, as in Fig. 3. There is a pattern of tapped holes over the entire area of the baseplate, so that any shape or size of template can be screwed down. The template rests on spacers through which the cap-screws run, to present a better bearing area to the pilot in the table. Also, a knife-like stop is screwed on to the baseplate, next to the template. The stop prevents the complete routing of the work-piece, leaving it attached to the strip with a small tip. If the stop were not used, the work-piece would fly out of the strip when completely routed, with the possibility of being damaged.

On the initial work-piece, the machine spindle height has to be adjusted so that the router bit will not plunge through the board. (The metal plate below the board prevents the bladder from being punctured, should the bit inadvertently be set too low.)

After a work-piece has been routed, the box is pulled away from the machine, the petcock is closed, and the air permitted to escape. The part is then broken off the strip, and the strip is indexed forward. With the petcock again opened, routing is resumed. Strips can be stacked so that more than one work-piece can be produced at the same time. The exact number, of course, depends on the strip gage. This particular box can route to a maximum thickness of 1/4 inch.

3. The template is being fastened to the baseplate bottom with an air-driven screwdriver. A stop on the right of the template prevents routing completely around the work-piece.

2. The "wrench" for the box is a simple petcock. A pressure of 5 psi is sufficient to thrust the strip firmly against the guide channels.

DRILLS with CHIP-REDUCE

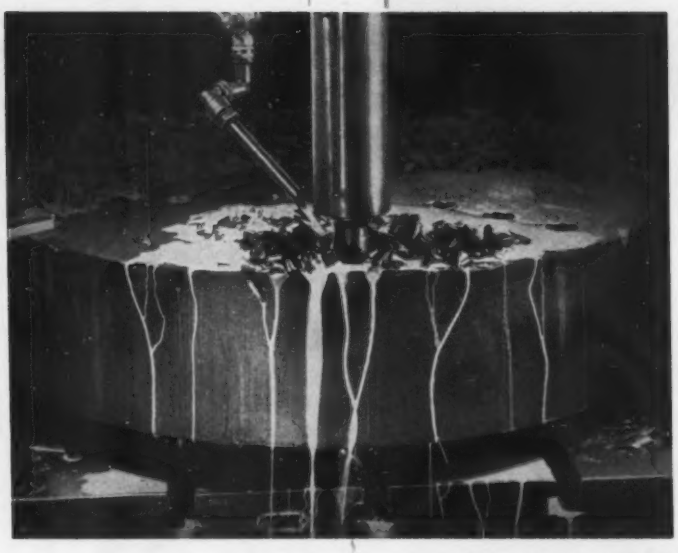


Fig. 1. A 15/16-inch hole drilled through a 6-inch-thick slab of SAE 1045 steel in fifty seconds with a drill having chip-breaking flutes. The feed was 0.027 inch and the speed, 270 rpm.

IN THE DRILLING of metals the "stringy" types often result in the formation of long chips that fly at high speed around the tool and present a serious hazard to operators. They also often clog the hole being produced and actually cause the drill to break. Another disadvantage when such a condition exists is the formation of circular grooves or scratches in the hole, burrs at the edge of the hole, and an enlarged diameter of the hole at the entering surface of the work.

All of these disadvantages are said to be overcome by "Speedicut Chipbreaker" high-speed steel drills recently placed on the market by the Chicago Heights Steel Co., Chicago Heights, Ill. The unique feature of these drills is a chip-breaking rib that is precisely milled along the full length of the two flutes; thus the chip-breaking feature is maintained throughout the entire drill life. The drawings in Fig. 2 clearly show the location and design of the chip-breaker ribs.

The cutting action of the drills is exactly the same as that of standard drills, the cutting being effected by the full width of the drill edges. The chips slide down the face of the flutes in the normal manner. However, as each chip contacts the chip-breaker rib, it is curled to a small diameter and broken off within a short length.

The short, tightly curled chips free themselves readily from the hole, leaving it unscarred and true to size for its full length. The efficient manner in which the chips are broken permits drilling feeds to be increased over conventional rates. For example, in drilling a 5/16-inch-diameter hole through a 1-inch section of an SAE 4140 forging heat-treated to 200 Brinell, a feed of 0.012 ipr (inch per revolution) was practical with a Chipbreaker drill as against 0.003 inch with a conventional drill. The speed was 600 rpm in both instances. The operation was performed on a power-fed, upright drilling machine.

In drilling 15/16-inch-diameter holes to a depth of 2 inches in armor-plate tank tops, a feed of 0.013 ipr could be used with the chip-breaking drills, as against 0.007 inch with conventional

BREAKER RIBS

Hole-Making Problems

drills. The speed in both cases was 155 rpm. Generally speaking, a heavier feed gives more satisfactory chip-breaking results than a lighter feed.

These Speedicut Chipbreaker drills are available in different styles, in addition to standard types. For example, drills can be provided in a stepped design for drilling holes to different diameters with one pass of the drill. Sub-land drills are available and also oil-tube drills having an oil hole extending down through the shank and then leading outward to grooves that run along the drill body surfaces to the cutting edge. Shanks may be straight or tapered. Special length types are particularly adapted to deep-hole drilling.

The point angle on these drills is normally 118 degrees. Most conventional drills are made with webs that increase in thickness from the point to the shank. However, these chip-breaking drills have a parallel web and a constant flute section. This design eliminates the need for increased web-thinning as the drill is shortened in length. With the small chips produced, and resultant absence of pronounced clogging, coolant flows freely to the drill point, thus giving improved heat dissipation and drilling performance.

No special regrinding is required with these drills, the lip-clearance angle and the chisel-edge angle being obtained in the usual way with any commercial drill-point grinder or by hand. Although the parallel web and constant flute section eliminate the need for increased web-thinning throughout the life of the tool, in some instances it is desirable to thin the point or chisel edge. The thinning of the chisel edge should be done between the maximum and minimum conditions indicated at A and B, Fig. 2. If too much stock is ground away in point-thinning so that the rib is destroyed, the chip-breaking feature will, of course, no longer exist.

These drills are intended for application on both ferrous and nonferrous metals. Sizes from 1/4 inch to 4 inches are regularly available, but larger can be had. In all cases conventional speeds are recommended, but heavier feeds as outlined.

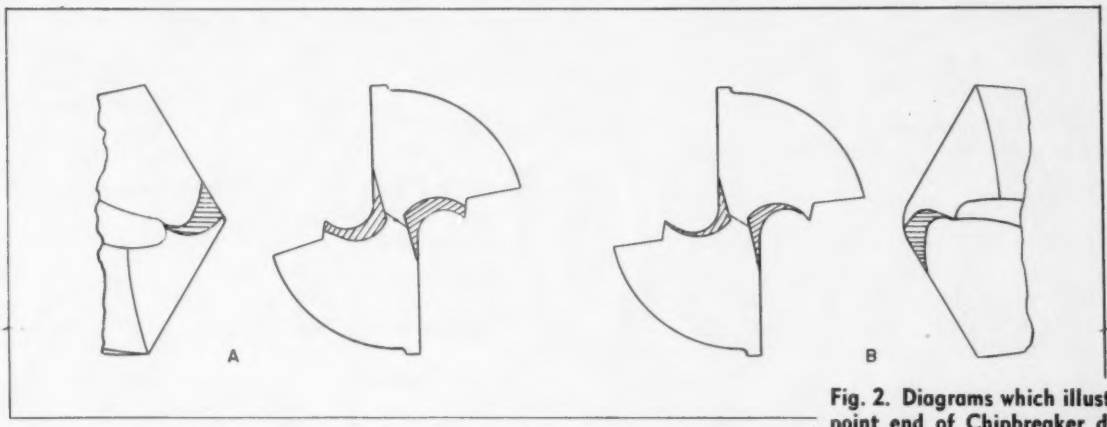
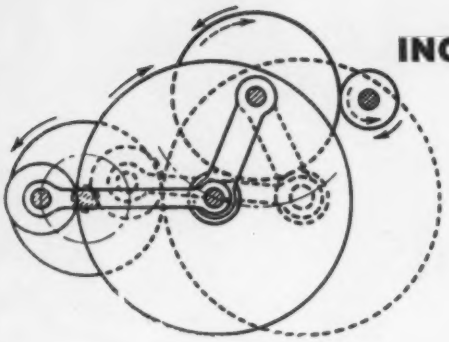


Fig. 2. Diagrams which illustrate the point end of Chipbreaker drills and by cross-sectional areas indicate the maximum and minimum amounts of web-thinning.



DRAWING MACHINE produces PARABOLAS, HYPERBOLAS, and ELLIPSES

THOMAS R. GOULDEN
Glasgow, Scotland

Second Prizewinner in MACHINERY's recent Competition

A DRAWING MACHINE built around a system of racks and pinions lets the draftsman produce parabolas, hyperbolas, and ellipses without plotting curves or making approximations with different radii. On the two sides of the folded insert, the mechanism is shown in plan view and in cross section.

The system is constructed around two focal points, or pivot lines, *A* and *B*. There are four different racks involved, converging at center line *C*. This center line is normal to the locus of the curve being drawn relative to the focal points *A* and *B*. Over the drawing board is a pencil gripped in a collet. A pivoting bracket on the right side of the board supports the collet shaft and connects it physically to center line *C* by an arm under the board.

On *C* is located one end of rack *D*. Pinion *E* on *B* engages this rack, as well as a second rack *F*. Rack *F*, in turn, extends back to *C*, and pinion *G* on *C* engages it. Pinion *G* is free on spindle *H*, but can be locked to it by disc *I*, when nut *J* is tightened.

Spindle *H* carries another pinion *L* which engages alternatively a third rack *K* or a fourth rack *M*. Pinion *N* on *A* engages rack *M*. Through levers *T* and *U*, the housing carrying racks *K* and *M* can be located and locked on *A* in a line parallel to *X-X*.

If the type of curve to be drawn so requires, racks *K* and *M* can be disengaged from pinion *L*, and their positions can be fixed relative to spindle *H*; that is, to center line *C*. This is done by yoke *O* which can enter a notch in the end of the two racks. Lever *P*, held in position by spring-loaded plunger *Q*, actuates the yoke. There is a central position for the yoke, which is used when the curve to be drawn requires both racks *K* and *M* to move relative to pinion *L*.

All racks are mounted on balls for ease of movement, as are focal points *A* and *B*.

Adjustment of Focal Points

The distance between *A* and *B* is adjusted to suit the variation in focal distance of the various curves under consideration. This is done by first locating slide *S* on *X-X*, locking knob *W*, and locating and locking levers *T* and *U*. Then, pinion *G* is locked, knob *R* is released to let the slide on which *B* is situated move freely, and spindle *H* is rotated.

If spindle *H* is rotated clockwise (as viewed from above), rack *F* moves to the left, in turn rotating pinion *E* clockwise. As a result, rack *D* moves to the right, and since one of its ends is anchored to spindle *H*, the distance between *B* and *C* is reduced.

At the same time, with rack *K* engaged by pinion *L* and rack *M* fixed relative to *L*, rack *K* will move to the right, and through pinion *N*, cause rack *M* to move to the left. This movement reduces the distance between *A* and *C*. Also, it further reduces the distance between *A* and *B*, while maintaining the ratios of *AC* to *BC*.

Similarly, rotating spindle *H* counterclockwise increases the distance between *A* and *B*. This distance is read on a scale scribed on a guide rod on the slide carrying *B* (view on arrow *Z*).

Variable Ratio of AC to BC

To vary the ratio of *AC* to *BC*, this procedure is followed:

Position slide *S* on *X-X*, lock knob *W*, locate lever *T*, and lock lever *U*. Engage rack *M* with pinion *L* by releasing the rack from yoke *O*. With pinion *G* running free, rotate spindle *H* counterclockwise. Rack *M* is moved to the extreme right and rack *K* to the extreme left when the yoke is located in the notch in rack *K*.

With pinion *G* now locked on spindle *H* and knob *R* locking the slide for *B*, rotate spindle *H* clockwise. As a result, *C* moves toward *B* and away from *A*, increasing the ratio of *AC* to *BC* while *AB* remains constant. Or, to decrease the ratio of *AC* to *BC*, rotate spindle *H* counterclockwise.

To Set Ratio AC = BC, Where AC + BC > AB

Lock slide *S* on *X-X*, by means of knob *W*, and release levers *T* and *U*. Tighten nut *J* to lock pinion *G*. Lock knob *R*. Disengage rack *M* from pinion *L* and locate yoke *O* in rack *M*.

Rotate spindle *H* counterclockwise while moving *C* away from line *AB*. *C* moves away from *A* and *B* at a constant rate, as determined by the pinions and racks. The required length of *AC* and *BC* is read from a scale on the housing holding racks *D* and *F* (view on arrow Z).

It can now be shown how the drawing machine is employed in producing parabolas, hyperbolas, and ellipses. All three types of curves appear in the illustration on page 158.

The Parabola

A parabola, View X, is a curve generated by a point moving so that its distances from a fixed point, the focus, and from a fixed line, or directrix, remain equal. Having determined the distance of the focal point *B* from the directrix of the parabola to be drawn, the procedure described under the heading "Adjustment of Focal Points" is followed in order to set the distance between *A* and *B*; that is, *AB* = distance of focal point from directrix, where *AC* = *BC*. Now lock knob *R* and release knob *W*.

Move *C*, by using knob *V*, in a path approximating the required parabola, and move slide *S* along its guides. The lengths *AC* and *BC* then increase or decrease proportionately, depending on the section of the curve and the direction of motion—*AC* is always the same length as *BC*. The conditions of the required parabola are thus met, and the pencil will reproduce the same curve on the drawing paper.

The Hyperbola

A hyperbola, View Y, is generated by a point moving so that the difference of its distances from two fixed points, the foci, is constant and equal to the transverse axis of the curve. Having determined the distance between the focal points of the curve, and the constant difference between *AC* and *BC* (equal to some value *x*), set the distance *AB* as described under the heading "Adjustment of Focal Points." Now set the difference between *AC* and *BC* as described under the heading "Variable Ratio of *AC* to *BC*."

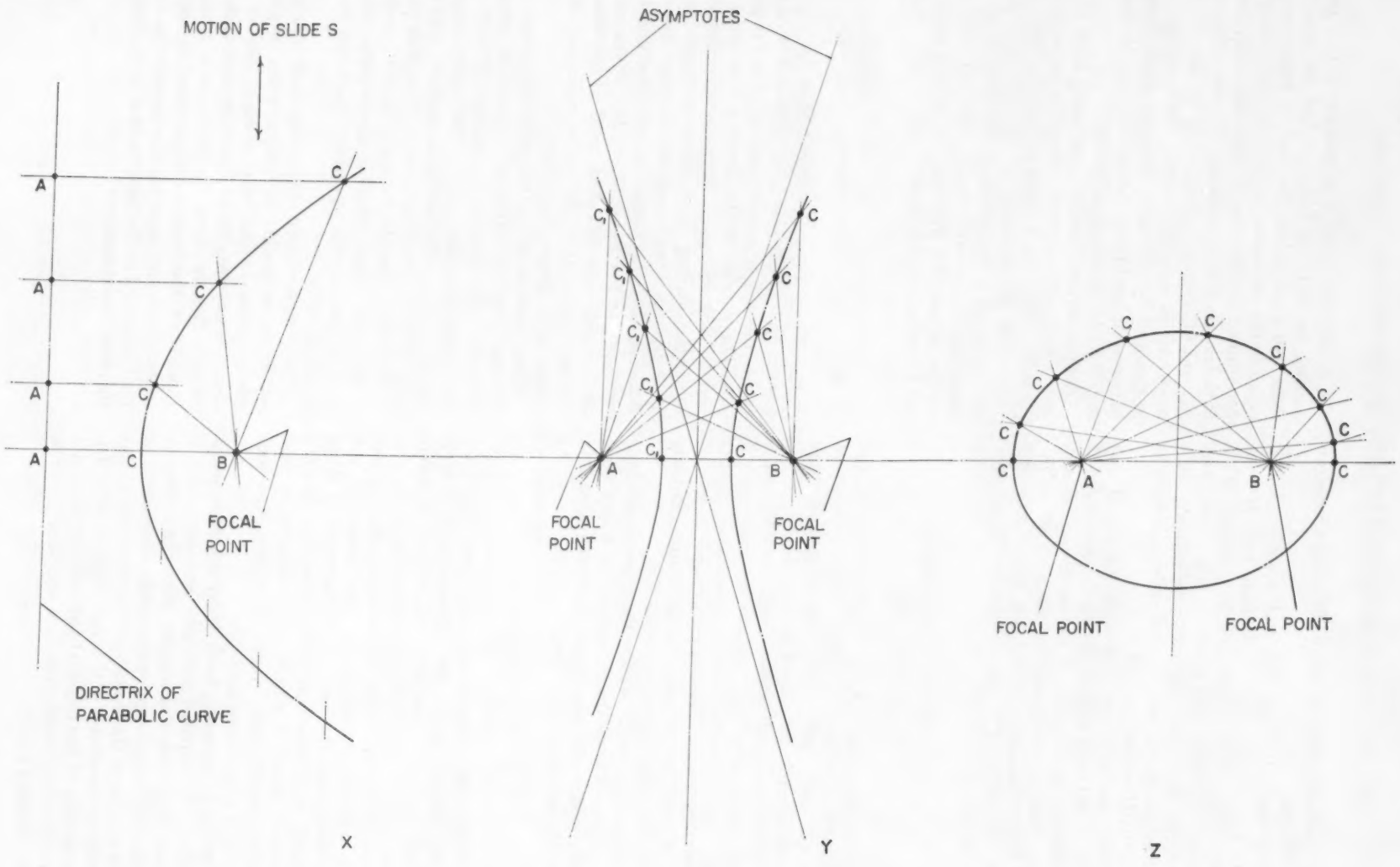
Release levers *T* and *U*, and using knob *V*, direct *C* in a path approximating the required hyperbola, when the lengths of *AC* and *BC* vary while still maintaining a constant difference, $AC - BC = x$. By reversing the procedure, the condition $BC_1 - AC_1 = x$ is obtained. This will set the system for drawing the second curve of the hyperbola, in which $AC - BC = BC_1 - AC_1 = CC_1$.

The Ellipse

An ellipse, View Z, is generated by a point moving so that the sum of its distances from two points, the foci, is constant and equal to the major axis. The conditions for drawing this curve are met by first following the procedure described under the heading "Adjustment of Focal Points" after having determined the distance between *A* and *B*. Then the instructions detailed under the heading "To Set Ratio $AC = BC$, where $AC + BC > AB$" are followed until a condition is reached where $AC + BC$ = the major axis of the ellipse to be drawn.

Next, loosen nut *J* to free pinion *G*, release rack *M* from yoke *O*, and rotate spindle *H* counterclockwise. This action engages rack *M* with pinion *L* and disengages rack *K*. When the extreme travel of these racks has been reached, yoke *O* is located in the notch in rack *K*. Then lock pinion *G*. It is now possible, by using knob *V*, to direct *C* in a path approximating the required ellipse, and the pencil will reproduce the curve on the drawing paper.

The pencil collet's supporting shaft can move axially in its bracket as well as pivot in a horizontal plane. In this way, a curve can be produced in any area of the drawing paper—not necessarily directly above the focal points *A* and *B*. In addition, the bracket can be raised for convenience in placing paper on the board. The board itself is hinged in the back, so that it can be lifted to adjust the system.


MOTION OF SLIDE S
ASYMPTOTES
A
C
B
FOCAL POINT
DIRECTRIX OF PARABOLIC CURVE
X
Y
Z

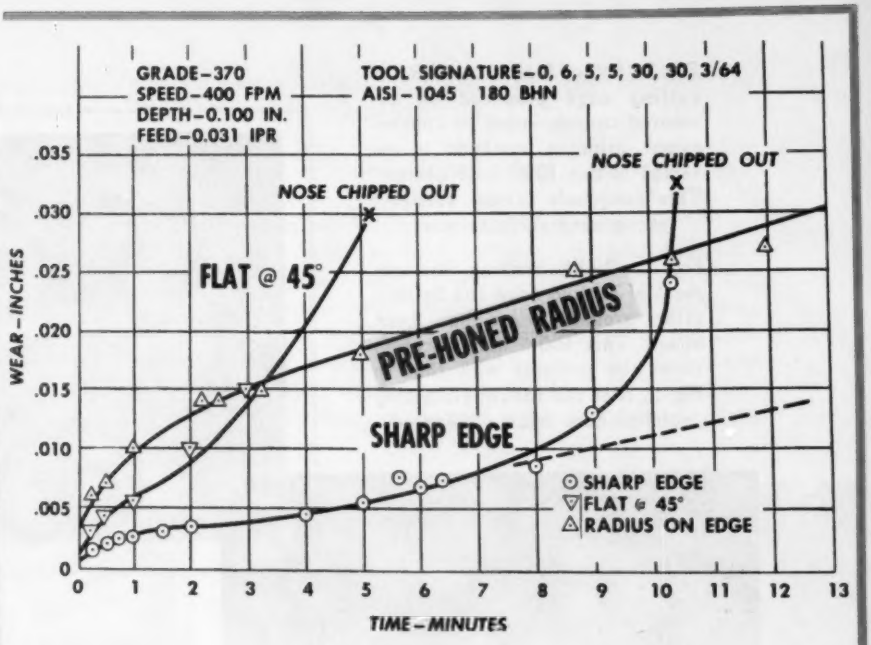


Fig. 1. Relationship between the life, or wear, of a cemented-carbide insert and its edge geometry is sharply brought out. Comparison is made between three cutting-edge conditions—45-degree flat, sharp (as ground), and "Pre-Honed"—on identical tools operating under identical machining circumstances.

"Pre-Honed" cutting edges stretch tool life

H. J. SIEKMANN, Manager
Market Development and Research
Metallurgical Products Department
General Electric Co., Detroit, Mich.

SIGNIFICANT INCREASE in the predictable life of cemented-carbide and oxide tools is directly attributable to a production method of "Pre-Honing" the cutting edges, developed by the Metallurgical Products Department of the General Electric Co. In addition, the use of harder, more wear-resistant grades (some of which could formerly be used only for finishing) for economical roughing operations becomes feasible.

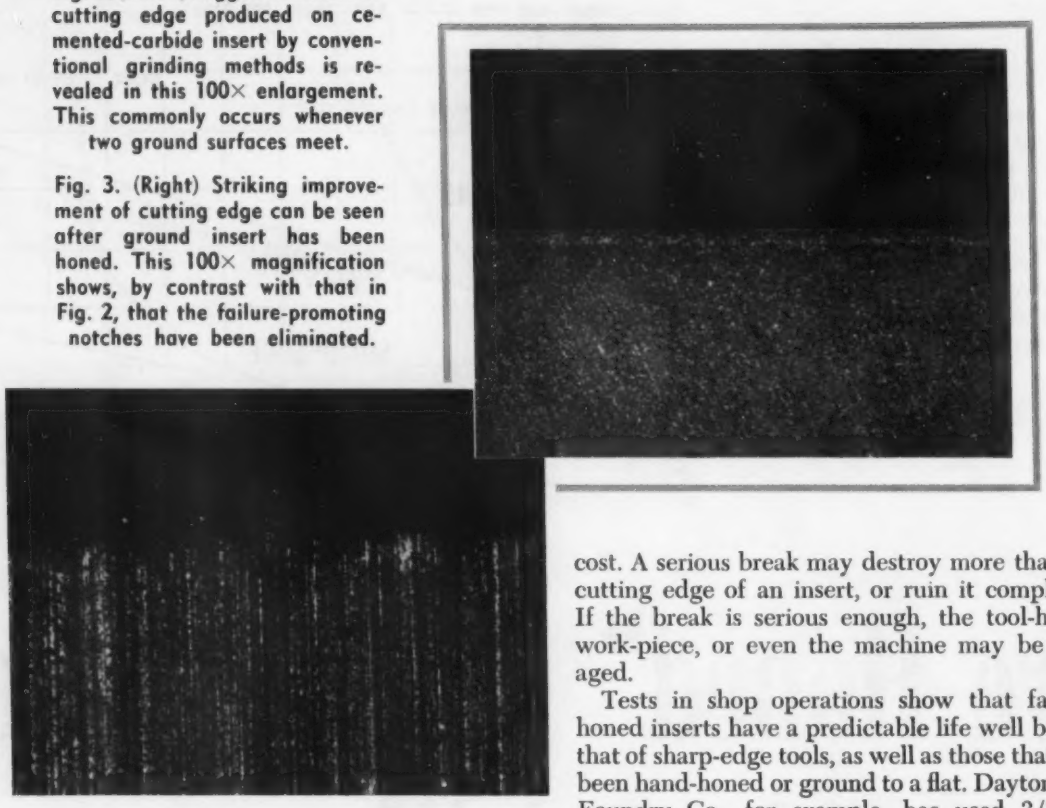
All cutting edges of Carboloy cemented-carbide or oxide inserts or tools that are honed by this method are brought to a uniform radius. Choice of radius depends on the operating conditions to be met. For general-purpose grades it is 0.002 to 0.004 inch: for harder, finishing grades it is 0.001 to 0.0015 inch. The radius is carried around each nose of the insert. Sides and top are accurately tangent, uniformly blending with the curve.

A Production Operation— Cost Down, Uniformity Up

Factory honing is a fast production operation. Besides generating a uniform radius around the entire insert—identical on each edge and for each unit of any lot—it is much lower in final cost per insert than hand honing. On this same thought,

Fig. 2. (Below) Jagged condition of cutting edge produced on cemented-carbide insert by conventional grinding methods is revealed in this 100× enlargement. This commonly occurs whenever two ground surfaces meet.

Fig. 3. (Right) Striking improvement of cutting edge can be seen after ground insert has been honed. This 100× magnification shows, by contrast with that in Fig. 2, that the failure-promoting notches have been eliminated.



if a machine operator is instructed to hand-hone inserts he will often shut down the machine while doing it, thus losing valuable production time.

Proper honing by hand with a small stone is difficult and time-consuming. Results are dependent on the skill of the operator, and close control is nearly impossible. It is not easy to keep the radius uniform and, at the same time, blend the curve properly with the flat surfaces of the tool. Hand honing is especially difficult around the nose radius. Errors in blending the nose radius and the end cutting edge will adversely affect not only the life of the tool, but also the surface finish it will produce on the work-piece.

Need for Increase in Predictable Tool Life

Increased predictable tool life is a need especially acute in automation where the unexpected failure of but one tool can shut down all or part of a costly line. It is of particular importance when centralized tool control and scheduled tool-changing times are involved. Users generally would prefer tool life that is shorter but uniform and predictable, rather than longer but random.

Unpredicted failures also increase direct tool cost. A serious break may destroy more than one cutting edge of an insert, or ruin it completely. If the break is serious enough, the tool-holder, work-piece, or even the machine may be damaged.

Tests in shop operations show that factory-honed inserts have a predictable life well beyond that of sharp-edge tools, as well as those that have been hand-honed or ground to a flat. Dayton Steel Foundry Co., for example, has used 3/8-inch triangular and 1/2-inch square honed Carboloy disposable inserts in their production operations for the past several months. Before these had been adopted, a tool-crib attendant had been assigned the job of hand-honing inserts in his spare time. As production increased, this task occupied nearly all of his time.

A job in point is the machining of cast-steel truck wheels (AISI 1022 to 1032) with a hardness ranging from 140 to 190 Brinell. Feeds employed are 0.015 to 0.019 ipr, with speeds ranging from 280 to 320 fpm. Cut depths vary from 1/8 to 3/8 inch and are interrupted while turning the larger diameter of the spokes. A factory-honed insert produced eighty-five pieces before being indexed, and then showed signs of wear only—no chipping. By comparison, an unhoned insert produced forty pieces before chipping and breaking. Dayton estimates that hand-honed inserts provide 25 to 30 per cent more tool life than unhoned inserts on all types of jobs, and that factory-honed inserts have increased this longer life by an additional 5 per cent.

Relationship between flank wear and cutting time is illustrated graphically in Fig. 1. It will be noted that the initial wear rate of the cutting edge having a "Pre-Honed" radius was more rapid than that of the insert with a sharp edge, but becomes linear after about five minutes of use.

With the flat edge, wear increased suddenly and failure occurred after a few minutes of operation. Gains achieved from factory honing apply equally to both cemented carbides and cemented oxides.

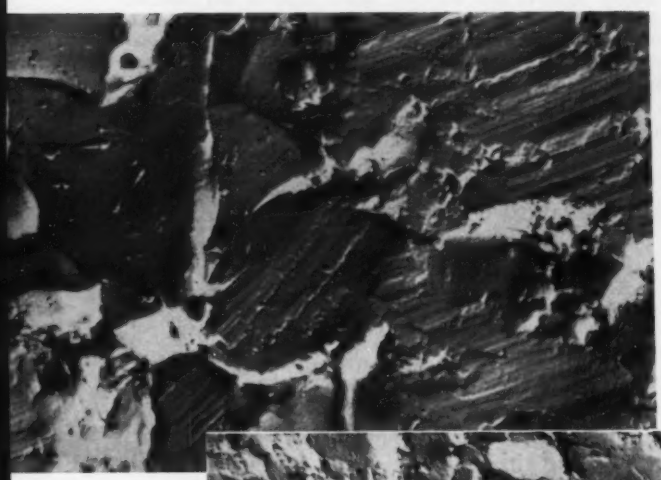
Background of Tool Honing

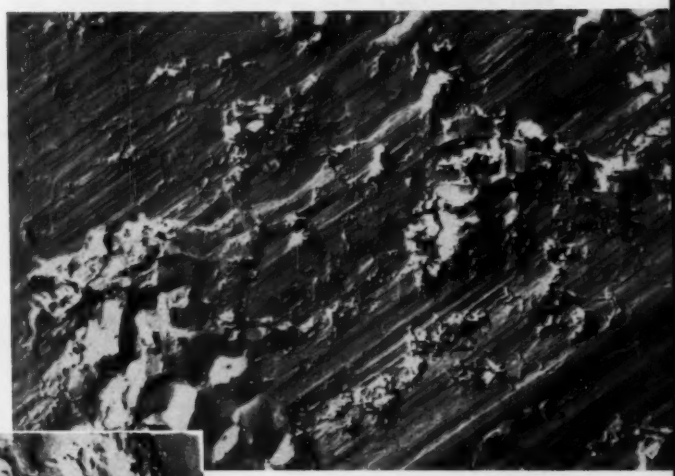
Increasing predictable life by dulling, or conditioning, the tool edge is not new. In 1942, when industry was under great pressure to produce artillery shells in enormous quantities, it was found that the harder, more wear-resistant grades of carbide would stand up in roughing operations if the cutting edges were honed. These harder grades cut faster, thus stepping up production. In addition, their use was essential in order to overcome the abrasive quality of the steel.

Because hand honing is too slow and arduous for a modern high-production shop, metal-cutting industries have tried other methods. Included among them are grinding a 45-degree flat, vapor blasting, and holding the edge against a loose, silicon-carbide abrasive belt. None of these has proved entirely satisfactory.

Why Are Honed Edges Superior?

Research into the nature of cemented carbides —their reaction to grinding and their behavior during metal cutting—has shed much light on the question of why conditioning the edge increases tool life, and why factory honing gives the best results. A material as hard as cemented carbide or cemented oxide is likely to be notch-sensitive. Any notches on the tool serve as starting places





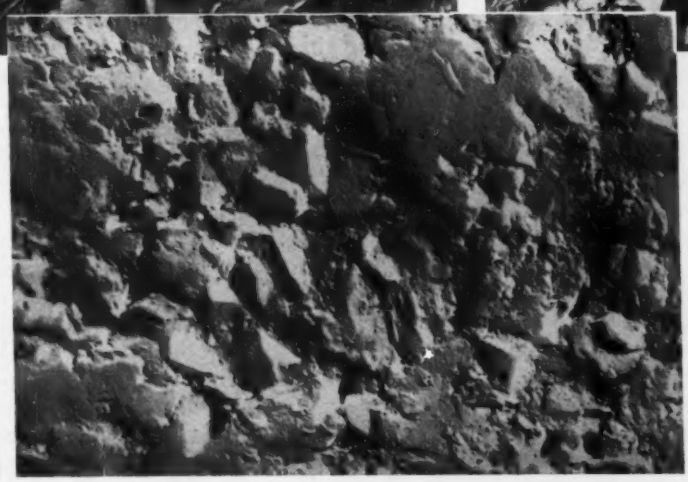
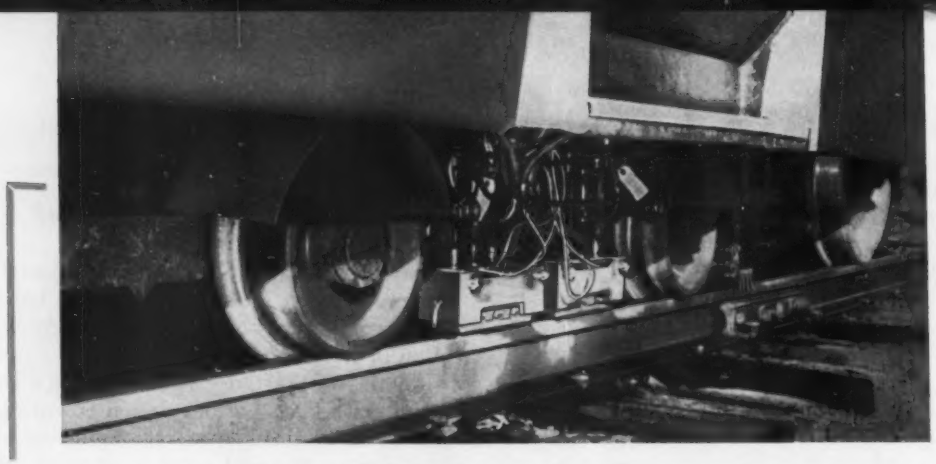


Fig. 4. (Top Left) Getting closer to the ground edge of a cemented-carbide insert with an electron microscope (10,000×). Grind marks are not too noticeable. Nevertheless, extensive crystal breakage and cleavage are visible.

Fig. 5. (Top Right) Ground edge of a softer grade of cemented carbide with a higher cobalt content than that shown in Fig. 4. Cobalt smear marks are evident over much of the surface in this 5000× enlargement, as is flaking of the crystals.

Fig. 6. (Lower Left) Surface of a honed cutting edge at 5000× magnification revealing that the damaged surface layer (such as is shown in Figs. 4 and 5) has been removed. Signs of cracking and flaking are no longer discernible.



FOR THE FIRST TIME, the entire length of New York City's subway rails can be checked for transverse defects and other flaws which might lead to derailments. A self-propelled car, owned and operated by Sperry Products Co., of Danbury, Conn.—a division of Howe Sound Co.—will work over the subway's 723.4 miles of rails at 15 to 20 mph without disrupting regular train movement. Ten ultrasonic search probes (five, carried by two sleds, cover each rail) send high-frequency impulses into the rails. These impulses are reflected from voids and the results are recorded by an oscillographic motion picture camera on a silver-bromide paper tape. Landmarks on the tape indicate flaw location—one yard of tape representing one hundred yards of track.

for cracks which can cause edge chip-out, progressing to complete failure by breaking. Even diamonds exhibit notch sensitivity. Starting from a fine scratch, they cleave readily in certain planes.

It is general practice to grind the surface of disposable units to a surface finish of 5 to 10 micro-inches. The object is a good cutting edge. This range of finishes provides the best average tool life for machining operations ranging from heavy roughing to precision finishing.

However, microscopic examination of the sharp edge produced by grinding reveals many minute notches and points, indicating that it is not smooth, but jagged (Fig. 2). This condition occurs whenever two ground surfaces meet. Fig. 3 shows, by contrast, a smooth, honed edge from which failure-promoting notches have been eliminated.

Any tendency to chip is aggravated by the high stress concentration at the cutting edge. This often reaches 200,000 psi, and may run as high as 300,000 psi. While cutting, a sharp edge is in tension due to its cantilever effect. A typical steel-machining grade of cemented carbide, Carboloy Grade 370, has an ultimate tensile strength of 205,000 psi, while its ultimate compressive strength is 631,000 psi. By conditioning the cutting edge, the material there is placed under compression during machining, thereby taking advantage of its higher compressive strength.

The presence of fine notches on ground cutting edges, combined with the material's notch sensitivity, indicates why the use of a ground flat is not the best means of increasing predictable carbide tool life. Although it does place the material at the edge under compression, it leaves unsolved the problem of the meeting of ground surfaces. There is also the difficulty of carrying the ground flat around the curve of the nose.

Electron Microscope Views Cutting Edges

Extensive studies have been conducted of cemented-carbide surfaces at ground edges, and at ground and honed edges, with the aid of an electron microscope. A 10,000× enlargement of a ground edge can be seen in Fig. 4. It can be noted that although there are not many grind marks, crystal-breakage and cleavage marks are frequent.

Fig. 5 is a 5000× enlargement of a similar ground surface, but on a softer grade of cemented carbide having a higher cobalt content. Grind marks in the superficial cobalt smear show on much of the surface. As in Fig. 4, there is evidence of crystal damage—flaking of the surface is prominent.

These are two of a long series of similar studies leading to the conclusion that the grinding of carbide is not a machining operation in the chip-formation sense but, instead, functions by the crushing and breaking of crystals. A corollary conclusion is that grinding tends to injure and weaken the cemented-carbide surface. As this damage is confined to an extremely thin layer, it is of little consequence on the flats. It can, however, cause trouble at an edge where two ground surfaces meet, tending to promote failure.

Illustrated in Fig. 6 is the surface of a factory-honed edge magnified 5000×. The damaged surface layer has been removed. There is no evidence of cracking or flaking and notches are avoided. Undamaged surface and a sound cutting edge with superior geometry yield improved performance in service.

MATERIALS

The properties and new applications of materials used in the mechanical industries

High-Strength, Heat-Treated Titanium Sheets for Aircraft Applications

The development of a heat-treated titanium-sheet alloy has been announced by Republic Steel Corporation, 1441 Republic Bldg., Cleveland 1, Ohio. This titanium sheet, identified as Type RS-140, is particularly attractive to the aviation industry in which it can be utilized in lightweight thin gages which conform to required strength ratings.

The alloy contains 5.0 per cent aluminum, 1.25 per cent iron, and 2.75 per cent chromium. It is available fully heat-treated in sheet gages as light as 0.010 inch and in sheet sizes up to 48 inches wide by 120 inches long. Its strength is in excess of 190,000 psi. Applications include skins, stiffeners, internal structures, engine nacelles, bulkheads, and heat shields for aircraft and missiles.

Dry-Film Lubricant with Good Adhesive Qualities

A specially prepared formulation of molybdenum disulfide that may be applied by spraying, brushing, or dipping has been made available by Poly Chem, 541 S. Webster, Indianapolis 19, Ind. The product, called Poxylube, exhibits good lubricity and adhesion. Surface preparation consists of simple degreasing. The dried film provides permanent lubrication on all types of rotating and sliding bearing surfaces.

Premeasured and Calibrated Stainless-Steel Shim Stock Introduced

Stainless-steel shim stock that is premeasured and calibrated to provide economical in-plant usage has been introduced by the Roblinger Co., 40 Cross East, Boston, Mass. Designated "Roblinger P.M.C." stainless-steel shim stock, each coil of stock is calibrated in 1/2- and 1-inch increments throughout its 60-inch length. The calibration consists of two 60-inch-long scales, one ascending and the other descending. This method of calibration facilitates the maintenance of a stock inventory count by showing the number of inches remaining.

The shim stock is available in nine standard

This is the Ford Motor Co.'s Levacar Mach I, a wheelless vehicle utilizing air propulsion. The car was built in three weeks and four days by Wettlaufer Engineering Corporation, Detroit, from a clay model provided by Ford stylists. Use of epoxy-resin formulations from Ren Plastics, Inc., Lansing, Mich., facilitated the construction of the interior assembly and molding areas.

sizes from 0.002- through 0.010-inch thickness and is made from Type 302 stainless steel, rolled full hard-spring temper. Applications include shimming of jigs, tools, fixtures, patterns, and machinery, as well as stampings, washers, and electronic parts.

Two-Part Nonmetallic Adhesive for Joining Metals

A plastic adhesive which adheres to most metals but has a nonmetallic base has been developed by Beetle Plastics of Crompton & Knowles, Fall River, Mass. Called "Bond-Seal,"

This is the way New Hampshire Ball Bearings, Inc., Route 202, Peterborough, N. H., package their miniature and instrument bearings using polyethylene buffers in a standard plastic vial. Use of these buffers prevents jiggling and prevents the inclusion of lint or other minute contaminants.

the adhesive is nonconductive and is not affected by corrosive chemicals. It was developed for use in electronic applications where adhesives containing metallic fillers were not acceptable.

It has good adhesive qualities with iron, steel, aluminum, wood, glass, concrete, epoxy, and polyester laminates. Applications include watertight and oiltight repairs on metals and other materials when nonconductivity and resistance to acids and alkalies are needed.

Enamel-Coated Aluminum Building Panels for Light Structural Uses

Enamel-coated aluminum building panels, adaptable to a number of uses on residential, farm, and light mercantile structures, have been introduced by Aluminum Company of America, 722 Alcoa Bldg., Pittsburgh 19, Pa. Called "Alcoa Colorib Panels," the building components are available in seven baked-on colors and feature trapezoidal corrugations with a diamond-embossed finish for extra strength and appearance.

The panels are lightweight (35 pounds per 100 square feet), corrosion-resistant, and virtually maintenance-free. The baked enamel finishes, applied over a bonderized coating, will not chip, crack, flake, peel, or blister under normal use. The panels are normally available in standard 8-, 10-, and 12-foot lengths having a width of 50 3/4 inches which provides 48 inches of coverage after overlapping.

Large Nonwelded Tantalum Sheet for Chemical-Reaction Tank Use

Production of large sheets of nonwelded tantalum was announced by the Kawecki Chemical Co., Boyertown, Pa. The size of this sheet is 36 by 72 inches and it is intended to be used primarily in the construction of chemical-reaction tanks where it will reduce the possibility of contamination. This sheet is 0.020 inch thick and weighs 32 pounds, but longer and thicker sheets are also available.

Tantalum is a rare metal which is chemically inert to all common mineral acids. Its immunity to chemical attack has made it important in the construction of acid-proof equipment in the chemical and metallurgical industries.

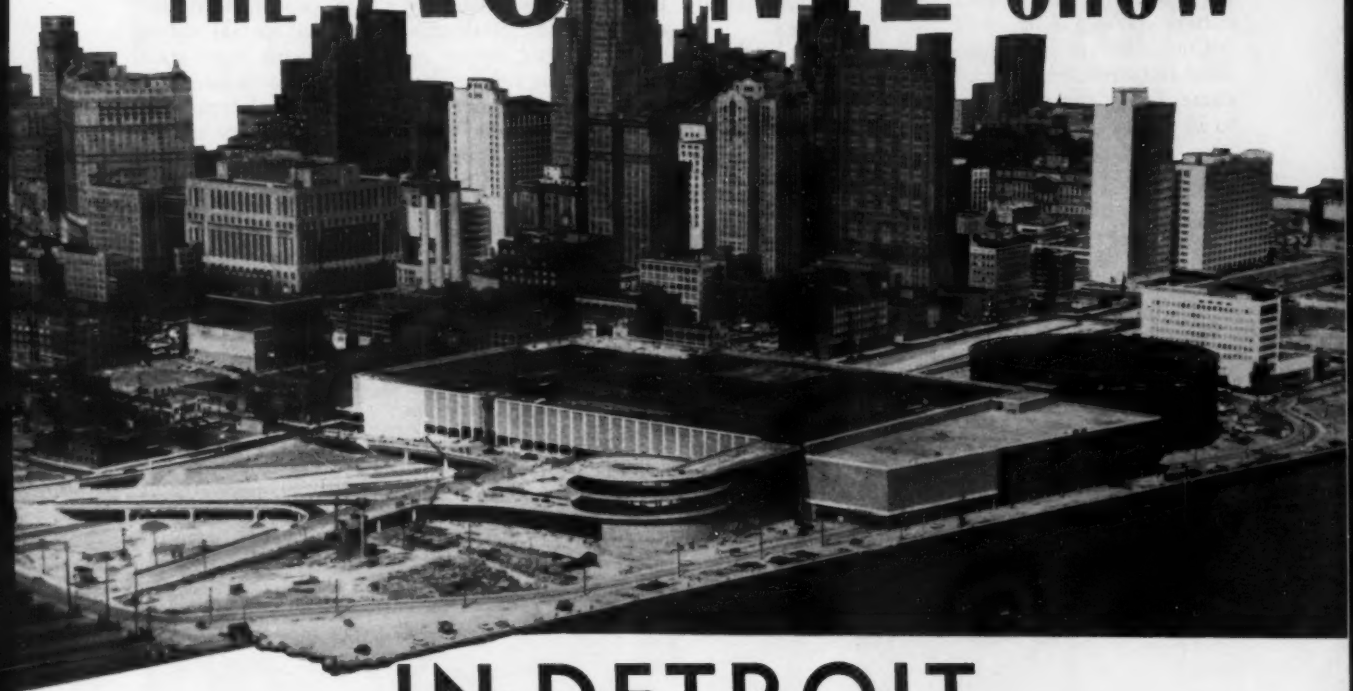
In addition, this tantalum sheet may be used in heat exchangers, bayonet heaters, coils, condensers, capacitors, and coolers.

Glass-Lined Steel Pipe that May Be Field-Cut

A glass-lined steel pipe that can be field-cut to required length and that has more than twice the glass thickness of previous glass-lined pipes has been introduced by Pfaudler Division of Pfaudler Permutit Inc., 1098 West Ave., Rochester 11, N. Y. This pipe, called "Pfaudler F-C Glasteel Pipe," offers wide application in highly corrosive services and is also ideal for those applications where freedom from product contamination or adhesion is required. It is corrosion and abrasion resistant.

Advantages claimed for its use are: it permits use of simple piping layouts, is quickly installed, and is inexpensively maintained. The pipe is available from stock in convenient lengths through 10 feet and is installed in four steps: Pipe is cut to length, it is threaded, the end is fire-polished for a smooth surface after cutting, and the pipe is finished with a belt sander for a flat gasket seat and sealtight flange connection.

THE ASTME SHOW IN DETROIT



HERALDED as the most important event of its kind ever to be held in Detroit, the 1960 Show and Conference of the American Society of Tool and Manufacturing Engineers will open its doors on April 21. It will last through April 28. The affair will be held in the Detroit Artillery Armory, 15,000 W. Eight Mile Road.

More than 500 exhibitors have taken space at the show for a one-level display under one roof. Products to be shown will include machine tools, precision-control and inspection equipment, abrasives, hand tools, automation devices, power-transmission equipment, cranes, hoists, conveyors, cutting tools, assembly equipment, dies, jigs, and fixtures. It is anticipated that over 6000 products will be on exhibit, 1300 of them new in the last year, and 900 to be premiered at this gigantic exposition.

The conference will comprise thirty-four technical sessions at which sixty-five papers will be presented. Among the subjects to be covered are: tooling and tool components, status of engineering education, machining of steel casting surfaces, value analysis, radio-isotopes for die-life tests, automation-numerical control, throw-away tip tools, air and hydraulic controls, milling high-strength thermal-resistant alloys, standardization of processes, and "The Impossibility of Communication."

Following pages will describe some of the new products to be seen for the first time at ASTME Show.

Hartex Division of Union Twist Drill Co. to Display Cutter and Profile Grinders

Tangent-arc profile grinders, because of their versatility, are the most interesting of a line of five basic machines to be demonstrated by the Hartex Division of the Union Twist Drill Co., Athol, Mass. Model Nos. 3 and 5 tangent-arc grinders, shown in Figs. 1 and 2, are designed for sharpening cutting tools having radii-formed profiles in their cutting surfaces and for grinding clearances on profile type, straight, or angular cutters and end mills.

Comprised of a reciprocating horizontal wheel-head and a revolving work-head, the Model No. 3 machine, Fig. 1, can accommodate arbor type cutters up to 10 inches in diameter and taper-shank mills up to 12 inches in over-all length. The Model No. 5 machine, Fig. 2, will handle arbor type cutters up to 30 inches in diameter and taper-shank mills up to 18 inches in over-all length.

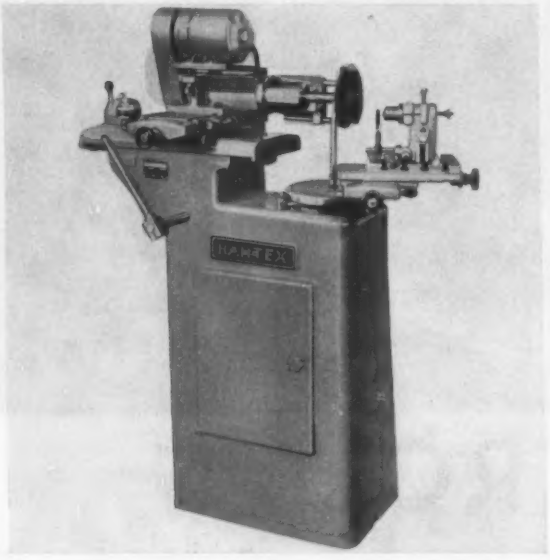


Fig. 1. Hartex Model No. 3 tangent-arc profile grinder

Typical operations performed on the Model No. 3 tangent-arc profile grinder include: grinding primary clearance on ball-end spiral-flute end mills, grinding corner radius on shell end mills, clearing top teeth on aluminum-cutting end mills, grinding primary clearance on top teeth of special spiral-fluted shank type cutters, diamond-wheel clearing of corner radius on carbide-tipped side-tooth saws, grinding primary clearance on top teeth of inserted staggered-tooth side mills, grinding clearance on angular teeth of shank type angular cutters, and clearing corner teeth on special spiral-flute shank type cutters.

Some of the wide range of operations performed on the Model No. 5 machine, Fig. 2, consist of grinding clearance on 180-degree radius on special slitting saws; clearing corner radius on shank type spiral mills; clearing side teeth of staggered-tooth side mills; clearing top teeth of carbide-tipped, shank type spiral mills using diamond wheel; clearing primary land on full radius of 2 1/2-inch-diameter ball end of six-flute, center-cutting end mills; and grinding chamfer of straight-fluted reamers mounted on center attachment.

The No. 1 cutter and reamer grinder, Fig. 3, is a versatile machine particularly suited for grinding primary and secondary clearances on plain, face, side, and angle type milling cutters. This unit will also handle end mills, reamers, slitting saws, and counterbores. It has a wide range of adjustment and the capacity for grinding a great variety of sizes and types of cutting tools.

A form cutter grinder which sharpens arbor type form-relieved milling cutters with either concave or convex type forms, straight or angular gashes, is another versatile machine of the Hartex line to be on

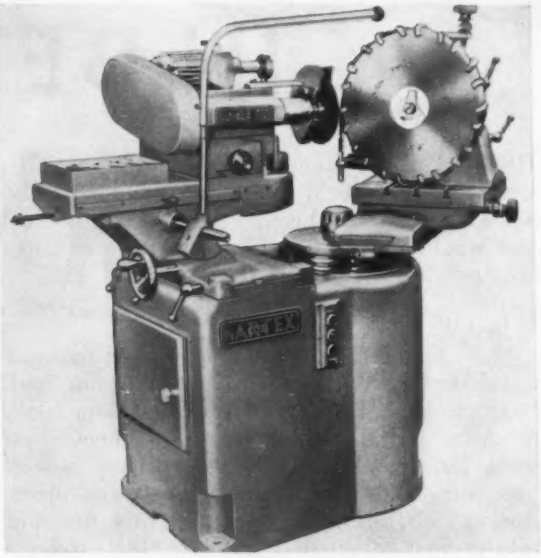


Fig. 2. Hartex Model No. 5 tangent-arc profile grinder

PRODUCTS

exhibition. This machine, Fig. 4, is of the hand-feed type designed for sharpening straight or angular-gashed (right- or left-hand) and similar form cutters. It features a tub-like, one-piece table which reciprocates horizontally on precision roller-equipped ways. An impressive variety of ingeniously designed precision attachments and optional equipment for the four cutter grinders illustrated are available.

The multiple-point drill grinder, Fig. 5, has been designed to perform rapidly and economically the following basic operations: grind 180-degree points; grind 135-degree points; grind (crankshaft) split points; perform grinding operation for web thinning; and reduce drill lip rake. Booth 1927.

Circle **606** on cards facing back cover

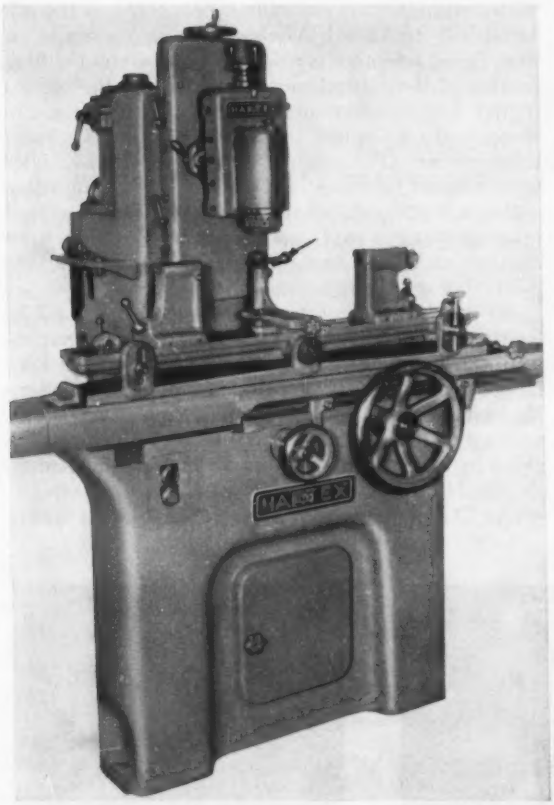


Fig. 3. No. 1 universal cutter and reamer grinder of Hartex line to be exhibited by Union Twist Drill Co.

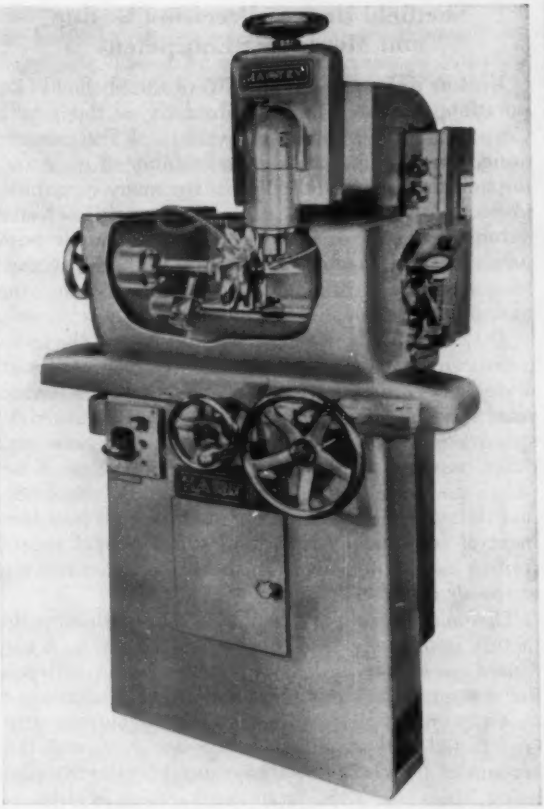


Fig. 4. No. 2 formed cutter grinder to be included in Union Twist Drill Co.'s Hartex line

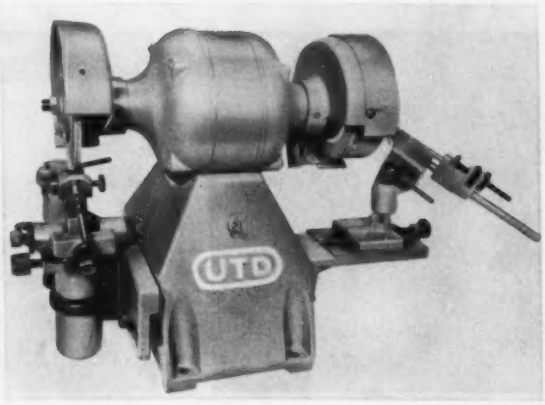


Fig. 5. Multiple-point drill grinder to be displayed by Union Twist Drill Co.

Sheffield Unveils Precision Gaging and Measuring Equipment

Visitors to Booths 500 and 405 of the Sheffield Corporation, Dayton, Ohio, a subsidiary of the Bendix Corporation, will see a large variety of Precisionaire dimensional comparators and adjustable air-gage tooling and fixtures. They will also see many electronic-inspection instruments and devices, air-to-electric automatic machine controls, and an automatic post-process gaging machine in addition to the X-ray gage for measuring the thickness of continuously moving material without contact. (See Fig. 1.)

Fig. 1. Sheffield Measuray gage

The Model 25 PT "Measuray" X-ray thickness measurement gage, Fig. 1, will be demonstrated with a single-pen recorder and a two-limit transistorized relay type classifier that can be used to actuate high-speed counting, sorting, and marking devices and other accessories. Utilizing 60 low-intensity X-ray pulses per second with each pulse of 100 micro-second duration, this gage makes instantaneous measurement of continuous strips of plastic films and sheets, ferrous and nonferrous foils, sheets, and bars moving at speeds up to 6000 fpm.

The instrument measures thickness without contacting or marring thin film or foil materials. X-ray pulses are simply flashed at a strip moving between the scanning unit's emitter and receiver. The amount of X-ray energy that passes through the moving strip is detected and amplified by the receiver, and the amount of thickness deviation caused by the material being "thick" or "thin" from nominal size is given in readings of per cent plus or minus or in millionths of an inch.

A broad-tolerance gaging range for "come-up" or approach and a higher amplification for final sizing to a close tolerance are features of the "Dual-Amp" Precisionaire instrument, Fig. 2, which will be introduced at the show. This gage spreads "thousandths" of an inch over inches of scale length in automatic sequence gaging. The dual-amplification instrument with two indicating columns is connected to the adjustable 3- to 12-inch Airebore gage by a single air line. Broad tolerance is read on one tube and the final portion of the full tolerance is viewed in the second higher amplification tube so that the operator can more easily see when the part is within the finish tolerance zone. For example, a part comes to a grinder with a broad tolerance of 0.010 inch and a finish size within a 0.003-inch tolerance. The 0.007-inch come-up or approach is read on the lower amplification tube and size within the final three thousandths as read on the higher amplification tube.

Another instrument to be demonstrated publicly for the first time at the ASTME show is the "Super-Amp" air gage, Fig. 3. This Sheffield long-range Precisionaire, column type air gage comparator offers 15 inches of linear gaging range. Super amplifications up to 100,000 to 1 without tube change are provided by means of the pneumatic amplifier and interchangeable scales.

The "Trans-Amp" duplicator, Fig. 4, to be intro-

Fig. 3. Sheffield Super-Amp gage

Fig. 4. Trans-Amp duplicator

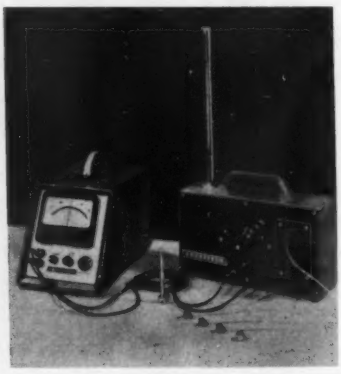


Fig. 5. Sheffield Teletemp instrument

PRODUCTS

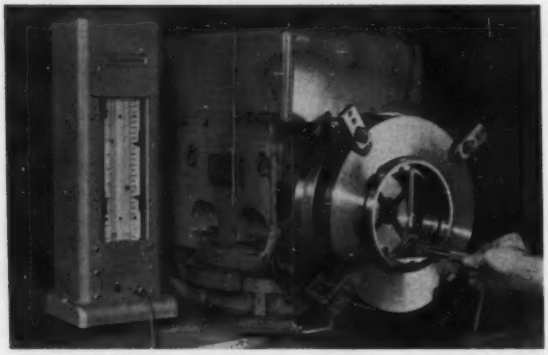


Fig. 2. Dual -Amp air gage

duced at the show, is designed to operate without an external power source. This Sheffield transistorized indicator is a small, compact, lightweight, portable, battery-operated amplifier with gage stylus. It provides maximum convenience in precision measurement. The battery does not require replacement as it is rechargeable. The instrument also operates on 110-volt, 60-cycle alternating current. The standard "0" center scale has three scale ranges—thousandths, tenths of a thousandth, and millionths of an inch.

The Sheffield "Teletemp" instrument, Fig. 5, measures the temperature of precision parts, gages, instruments, and machines, and the surrounding air with respect to a reference temperature. It indicates the deviation as plus or minus one-tenth, one-twentieth, or one-fortieth of a degree on the "0" center equilinear scale. Five copper thermocouples with magnetic base serve as the temperature pickup units.

In addition to the equipment illustrated and described, Sheffield will have on demonstration in Booth 405 an in-the-press "Press-Pacer" transfer unit which will move a stamping through a series of die stations in a simulated press at each stroke of the ram.

Circle **610** on cards facing back cover

Automatic Presses and Oscillating-Belt Grinder to be Shown by Sales Service

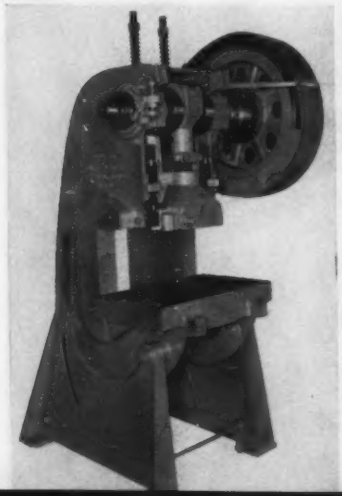
An actual production job running on a 40-ton "Havir" high-production automatic press will be one of the features of the exhibit of Sales Service Mfg. Co., St. Paul, Minn. This working exhibit has been arranged through the cooperation of the Detroit Controls Co. Another featured machine is a 40-ton "Press-Rite" open-back inclinable press, Fig. 1, with an all-steel frame that provides for a generous die area without sacrificing rigidity. This press will be equipped with a "Havir" roll feed and will be operating under power.

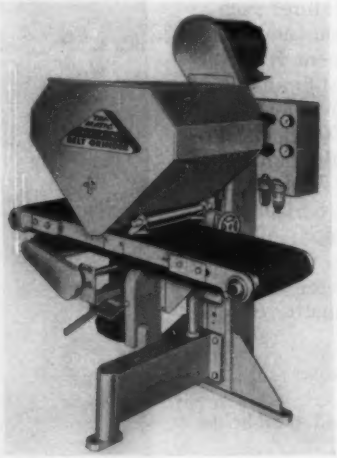
A third machine to be demonstrated is the "Tri-Matic" oscillating-belt grinder, Fig. 2, which is being shown for the first time. This machine will demonstrate aertronically controlled belt oscillation; fast abrasive belt changing; and a broad range of applications such as deburring, grinding, and polishing.

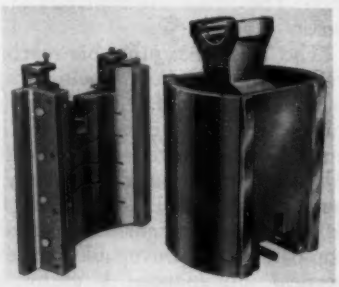
Other machines to be shown include an 8-ton "Havir" expanded bed high-production automatic press, a 5-ton Press-Rite open-back inclinable floor model, a 15-ton Press-Rite open-back inclinable deep-throat press, a Model 3CH Keller power hacksaw, and a Keller deluxe-model die filer. Also actual examples of the exclusive "Havir" cylindrical and cylindrical type rams and ramways, such as shown in Fig. 3, will be on display.

Circle **613** on cards facing back cover

Fig. 1. Forty-ton Press-Rite open-back inclinable press







▲ Fig. 3. Havir cylindrical ram and cylindrical ramway

◄ Fig. 2. Tri-Matic oscillating-belt grinder

Jones & Lamson to Exhibit New Optical Comparator TC-10

The Optical Comparator Division of the Jones & Lamson Machine Co., Springfield, Vt., will have thirteen of its optical comparator and measuring machines set up and operating at the show. Featured on the various models of J & L 30- and 14-inch comparators (all of recent design) will be several developments of considerable importance to the optical-inspection field. These include: normal reflection units which provide almost unbelievable surface images even at high magnifications; electronic power elevation, that provides fingertip control; a light concentrator that produces brilliant, reflected images of objects that vary in surface finish; and mercury arc-light illumination that provides five times the light intensity of the brightest tungsten-filament lamps. These are just a few of the developments which will be demonstrated.

The outstanding J & L exhibit will be a model comparator Figs. 1 and 2, to be shown for the first time. This Model TC-10, described as "a new dimension in the optical inspection field," is a relatively small machine having great accuracy and versatility. It has a 10-inch screen and weighs only 250 pounds, but is said to have the stability and construction of large machine tools. It accommodates 8- by 10-inch overlay charts and is available with eccentric chart-holders in either the vertical position, Fig. 2, or the horizontal position, Fig. 1. It has a 5-power lens that provides 2 inches of lens area and accommodates lenses of magnifications ranging from 5× to 125×. It comes with any one of three different staging tables. The standard full measuring table provides a measuring area of 6 square inches, 3 inches horizontally and 2 inches vertically.

All lenses and mirrors are coated for extra light transmission and extra reflectivity. No mirror or lens adjustments are necessary when changing magnification. The lenses are replaced by just a twist of the wrist.

The TC-10 has other big machine features such as reflection inspection, tracing inspection, and angle measurement. In fact, angle measurement is accomplished, and read directly to the nearest 5 minutes of angle, without even disturbing the overlay charts. All measurements are read directly to 0.0001 inch without computation. This holds true for either horizontal or vertical measurements. For added flexibility this comparator is convertible for either horizontal or vertical illumination. A custom-designed, all-metal base provides a three-point bearing which, with standard conversion equipment, changes the horizontal machine to a vertical unit in a matter of minutes. Booth 1208.

Circle **611** on cards facing back cover

Fig. 1. (Above) Jones & Lamson Model TC-10 comparator or with horizontally positioned eccentric chartholder.

Fig. 2. Comparator with vertically positioned chart-holder

PRODUCTS

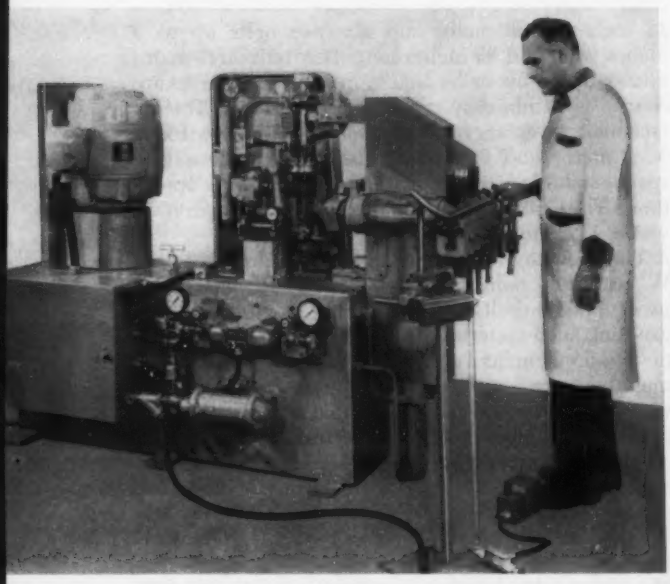
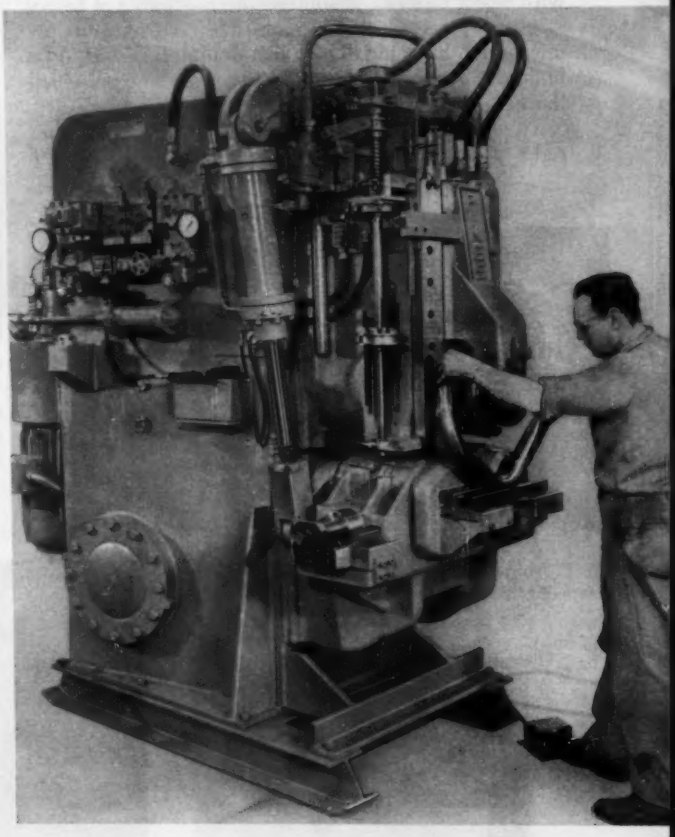


Fig. 1. Pines Model 3-T press for progressive bending of tubular parts at rates up to 1500 bends an hour

Fig. 2. Pines 30-ton bending press with capacity for progressive bending of 3-inch diameter tubing at rates ranging up to 800 bends an hour

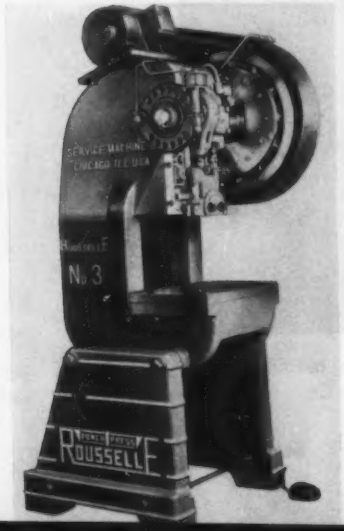


Pines Production Type Bending Presses

Two bending presses, the Model 3-T Hi-Speed, Fig. 1, and Model 30-T, Fig. 2, recently introduced by Pines Engineering Co., Inc., Aurora, Ill., will be exhibited for the first time and in operation at the show. These presses are designed for fast, progressive bending of tubing up to 1 inch in diameter, pipe, and certain rolled or extruded shapes.

A Model 660 end-finishing machine for simultaneous deburring, facing, and chamfering operations will also be shown for the first time. In addition, the Model 1 1/4 will represent the Pines line of ten sizes of hydraulic rotary bending machines designed for fast, accurate cold-forming of a variety of shapes in various metals. Booth 1839.

Circle **615** on cards facing back cover



Rousselle Model 3 open-back inclinable press

Rousselle Punch Presses

The Service Machine Co., Chicago, Ill., will exhibit its Rousselle line of punch presses. Among the units scheduled to go on display will be the Model 3 open-back inclinable press equipped with electrically controlled "Econo-Air" friction clutch. This is only one of more than thirty models of Rousselle presses having capacities ranging from 5 to 40 tons which are now available. Booth 1722.

Circle **614** on cards facing back cover

Abrasive-Belt Grinding Equipment to be Shown by Production Machine Co.

The Production Machine Co., Greenfield, Mass., will exhibit an abrasive-belt grinding attachment for the first time at the Tool Show. This new design of grinding unit, Fig. 1, is built for mounting on heavy-duty lathes, mills, planers, or other machine tools where grinding operations are required. It is equipped with heavy taper-nose spindle and is capable of heavy stock removal, close-tolerance size control, and low micro-inch finishing. The finish obtained is said to be limited only by the accuracy of the machine on which the new attachment is installed.

The standard model can be furnished for either right- or left-hand assembly and uses a contact wheel 12 inches in diameter and abrasive belts up to 4 inches wide and 86 inches long. Belt tension is maintained by an air or hydraulic cylinder, and tracking control is within easy reach of the operator. The attachment is arranged with timing belt drive for a 5-hp motor and can be furnished for various belt speeds suitable for many grinding and finishing operations. The unit may also be mounted in a horizontal, vertical, or angular position.

The company will also exhibit a standard type 484-W centerless polishing machine, Fig. 2, which also uses abrasive belts. This machine is equipped for grinding such materials as glass, stainless steels, plastics, and phenolic laminated tubing or rods which must be ground or finished by the wet method using waterproof abrasive belts. This machine is similar to the standard models, but has been designed for wet operation. It is equipped with separate feed drive-motor, coolant pump, suitable spray nozzle, and necesssary splash guards.

Available in a single or duplex model, it is capable of high production finishing and polishing operations where size tolerances are not important. It can often release more expensive machines for heavier work.

A standard Type 486 centerless grinding machine using abrasive belts arranged as shown in close-up, Fig. 3, will also be demonstrated. This is a smaller model centerless grinding machine for precision

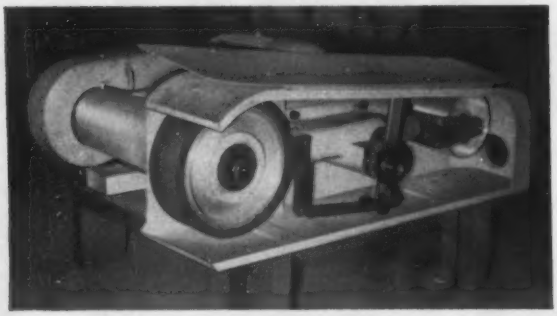


Fig. 1. Abrasive-belt grinding attachment to be exhibited by Production Machine Co.

Fig. 3. Close-up of Production Machine Co.'s Type 486 centerless grinding machine

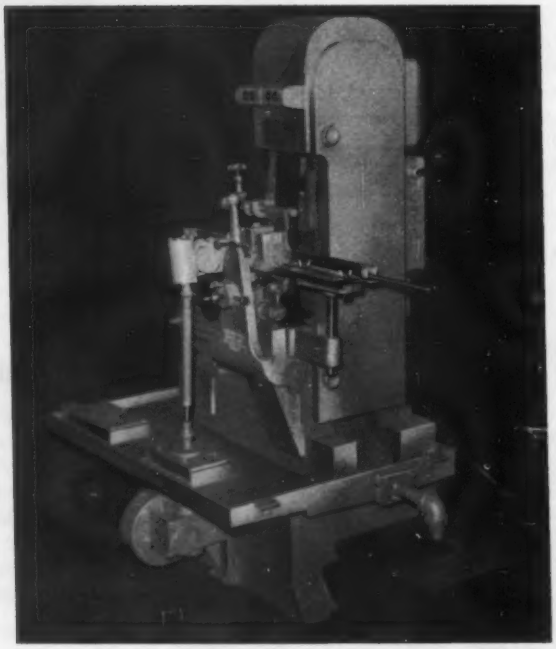


Fig. 2. Standard 484-W centerless polishing machine to be shown by Production Machine Co.

PRODUCTS

grinding and finishing small parts by a plunge cut or the through-feed method.

Equipped with precision guides, it uses a precision-ground steel contact roll for grinding, or a rubber-faced contact roll for low micro-inch finishing. Change-over of roll and belt can be made quickly.

Differing from the two larger models only by size, capacity, and arrangement of contact rolls, the Type 486 machine is recommended and intended for use where light precision centerless grinding is required.

Circle **607** on cards facing back cover

Littell to Show Equipment for Feeding and Processing Coiled Stock

Equipment to be displayed by the F. J. Littell Machine Co., Chicago, Ill., will include the rack-and-pinion roll feed, Fig. 1, shown mounted on an open-back inclinable press. This feed is equipped with disc type brakes for accurate feeding at high speeds. It is also equipped with a running micro adjustment which will permit adjusting the feed length within limits of plus or minus 1/8 inch while the press is running.

A No. 212-17 roll hydraulic variable-speed straightening machine, Fig. 2, will also be exhibited. This machine is normally used for straightening thin stock or for producing very flat stock in heavier materials. It can also be used to straighten parts which have previously been blanked out in punch-press operations. The hydraulic variable-speed drive permits operation at speeds from 0 to 72 feet per minute.

Another exhibit will be the No. 25-18 double automatic centering reel, Fig. 3, designed for handling coils weighing up to 2500 pounds and in widths up to 18 inches. This reel is so designed that a coil on one of the set of supporting arms can be paying off the stock to the using equipment, while the other side is being loaded. After one coil has been used up, the new coil can be swung into position ready for use.

Also to be unveiled is the No. 485 Littell motor-driven rack-and-pinion type drive straightening and feeding machine, Fig. 4. This unit is designed for straightening and feeding 0.037-inch-thick by 8-inch-wide steel stock. This machine will feed 0 inch to 8 1/2 inches at 60, 90, or 120 cycles per minute, and is to be equipped with an air-operated friction clutch for driving the rack-and-pinion mechanism.

A No. 25-12 Littell power winder for handling coils weighing up to 2500 pounds with a maximum width of 12 inches will be on display. This winder has a collapsible 12-inch-diameter drum. Opening and closing of the drum is accomplished with an air cylinder used for winding scrap skeleton from punch presses.

Circle **619** on cards facing back cover

Fig. 1. Littell rack-and-pinion roll feed on open-back inclinable press

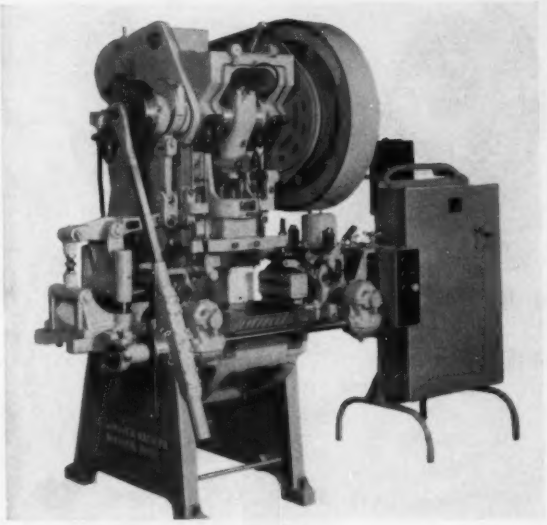


Fig. 2. Roll type hydraulic straightening press exhibited by F. J. Littell Machine Co.

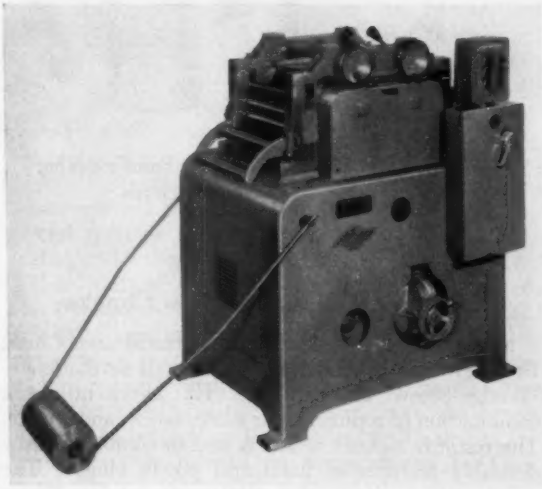


Fig. 3. Littell double automatic reel for handling heavy coils

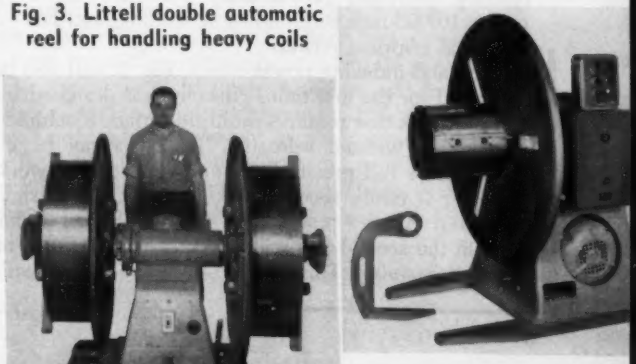


Fig. 4. (Far Right) Littell straightening and feeding machine

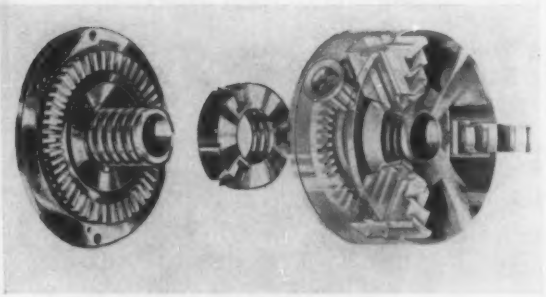


Fig. 1. "Wedge-Screw" chuck introduced by Skinner Chuck Co.

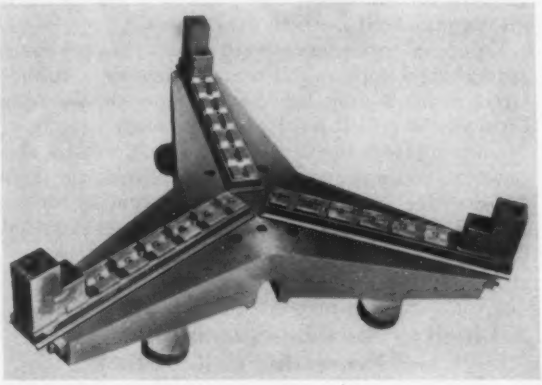


Fig. 3. Special purpose Skinner chuck for welding positioners

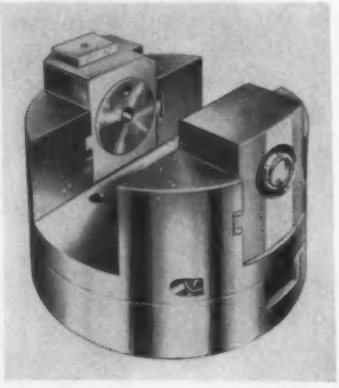


Fig. 2. Skinner hand-indexing power chuck

Skinner Will Exhibit New Chucks

New products to be exhibited by the Skinner Chuck Co., New Britain, Conn., will include its revolutionary "Wedge-Screw" chuck, Fig. 1. This chuck utilizes a combination of a pinion-gear plate, screw, and wedge. The result is a chuck which is said to combine all the desirable features of hand and power chucks. The chuck is accurate within 0.001-inch total indicator reading, provides repeatability without adjustment within 0.0005-inch total indicator reading, and has exceptional gripping power.

The hand-indexing power chuck, Fig. 2, will also be displayed for the first time. This chuck is designed for holding work that requires multiple-surface machining or grinding without releasing. The jaws can be indexed under full pressure without touching the work. Indexing is easily accomplished by means of a slide plate and Allen wrench. The use of another index plate in the second jaw will permit a wider choice of indexing positions. This chuck is designed for use with valve bodies, plumbing fixtures, universal joints, and similar items.

Another feature item will be the new power chucking unit for Brown & Sharpe automatic and hand screw machines. This Skinner power chucking unit makes it possible to convert Brown & Sharpe and other small screw machines to air chucking. With this unit, it is possible to chuck cold-drawn and odd-shaped parts quickly and economically. It consists of a 4-inch air chuck with two or three jaws, a threaded draw-bar, a rotating air cylinder and cylinder adapter. Accessories include soft blank top work-holding jaws, flexible air hose and fittings, and three-way control valve. If greater production is desired, automatic feed hoppers, work ejectors, and automatic cam controls can be added to permit an operator to tend more than one machine.

Still another addition to the Skinner line is the new series of trough type vises made of "Ductile Iron," a new metal developed to combine the best features of steel and cast iron. These vises feature a large trough for guiding the returning coolant. A swivel base for setting the vise at any angle through 360 degrees is optional. Jaw opening is equal to the full width of the jaws. Capacities are: 4, 5, 6, 7, and 8 inches.

A line of soft blank top jaws will also be featured. Designed for all chucks made to American Standards, these jaws come in a complete range of sizes in standard, extra long, extra high, and pointed shapes. They are available in serrated and tongue-and-groove construction.

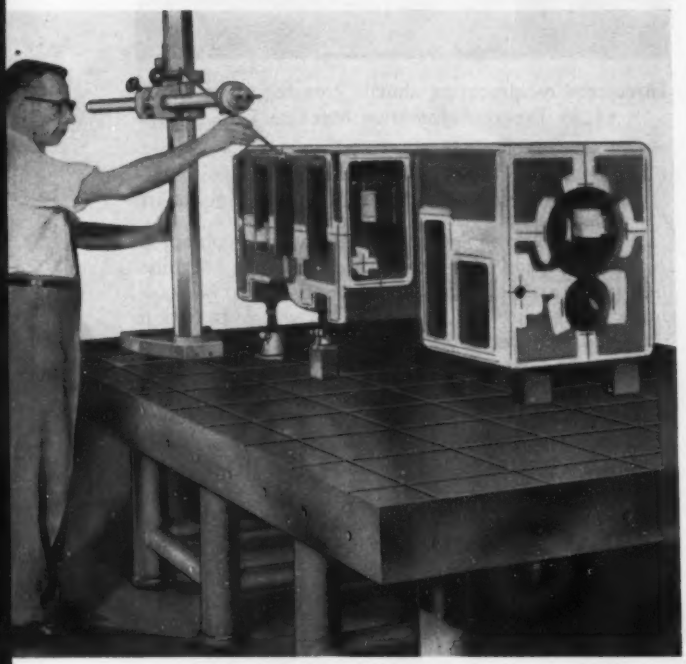
A special purpose chuck, Fig. 3, for work-holding on welding positioners is also being introduced. This chuck is capable of holding work up to 40 inches in diameter. Booth 1338.

Circle **623** on cards facing back cover

PRODUCTS

Portage Layout Machines Eliminate Hand Tools

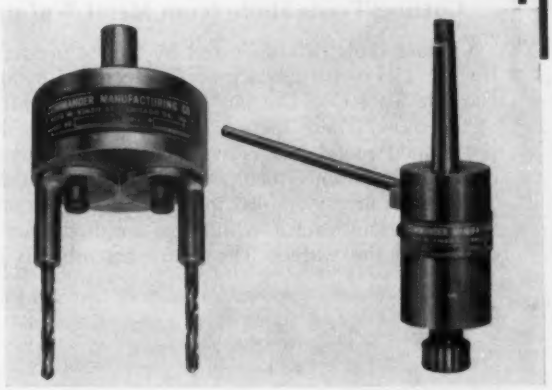
Portage Double Quick, Inc., Akron, Ohio, has announced the addition of three new sizes to its present line of layout machines which will be displayed at the show. Layout work can now be done on 2-, 4-, 6-, and 8-foot high castings. Horizontal reach is 18, 36, 48, and 48 inches, respectively. These machines can quickly lay out vertical, horizontal, inside, or outside lines for final machining. The work-piece, in most cases, does not have to be clamped or moved once it is positioned. Angle plates, protractors, and other hand tools are completely eliminated. Layout work is said to be reduced as much as 80 per cent. Increased accuracy over hand methods is also claimed for this new equipment.



Layout machine to be shown by Portage Double Quick, Inc.

The upright column, cross-arm, and linear attachment are equipped with vernier scales, calibrated to 0.010 inch. Vertical and horizontal distances from center lines can be established by simply adding or subtracting from reference points. Slots in the table base provide an accurate guide for machine travel in either direction at 90 degrees. These slots on the surface of the table can be seen in the illustration.

Circle **621** on cards facing back cover



(Left) Commander Model "200" two-spindle drill head. (Right) "Midget" tapping head

Small-Size Multiple Drilling and Tapping Heads

The smallest drilling and tapping heads ever to be produced by the Commander Mfg. Co., Chicago, Ill., will be among the many production tools to be displayed by this company. The Model "200" two-spindle unit, shown at the left in the illustration, is designed for close-center, multiple-spindle drilling and tapping jobs. This unit features a full ball-bearing drive, with special friction bearing spindles and "full face" heat-treated spindle-drive gearing. It is a rugged production tool which can be mounted on any drill press and it can drill a wide variety of hole patterns in a 2-inch-diameter circle. A full complement of standard and special spindles is available which will be demonstrated at the show.

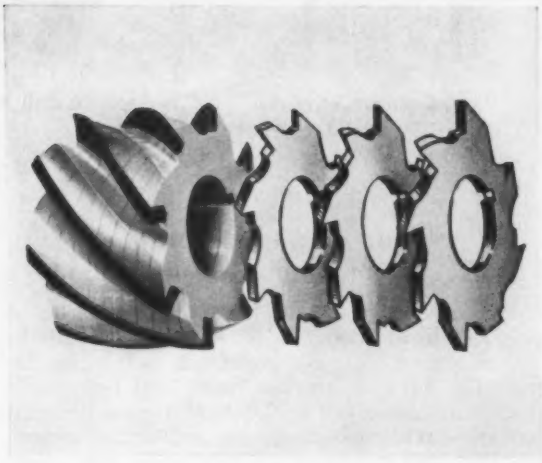
The "Midget" tapper, shown to the right, is only 1 9/16 inches in diameter. This attachment is designed to handle taps up to the 10-32 size in steel, and incorporates a pressure-sensitive version of the "Commander Spring Clutch" used in the "Commander Tapper." The small size and light weight of the tapper permit it to be used on the smallest drill units.

Another new tool to be demonstrated by Commander is the Model "A" multiple-angle drill unit, a self-actuating type which may be adapted to a variety of power sources. The unit's built-in feed and return air cylinder has a full 4-inch power stroke. Any stroke length up to the unit's capacity may be pre-selected. The small size (1 1/2-inch diameter) and long stroke of the model "A" multiple-angle drill unit make it well adapted for a variety of production drilling set-ups. In addition to these products, six other multiple-drilling models, six different tapping heads, and additional drilling and tapping equipment will be shown. Booth 313.

Circle **620** on cards facing back cover

Cutting Tools Made from Metal Wafers

Cutting tools manufactured by a new pre-formed metal-wafer construction process developed by Spiral Carbide Tool Co., Detroit, Mich., will be exhibited at the show. These "new type" tools are made from pre-formed metal wafers with cutting tool geometrical configurations incorporated into their design. The wafers are assembled in required lengths on arbors of various sizes. Carbide tips are then placed in cutouts in the wafers. The entire assembly is then brazed into a solid mass and the tool finished by conventional cutter-grinding methods.



Cutter of pre-formed metal-wafer construction to be shown by Spiral Carbide Tool Co.

Shank type tools such as reamers, core drills, etc., as well as arbor type tools such as plain mills with either straight or true-spiral flutes, can be manufactured by this method. The company claims that original tooling costs can be cut as much as 30 per cent and replacement costs as much as 50 per cent by using tools fabricated from wafers. In addition to this saving, the increased density of these tools is said to improve tool performance by acting as a vibration dampener. Booth 1654.

Circle **612** on cards facing back cover

Harig to Show Carbide Dies, Grinders, and Fixtures

The Harig Mfg. Corporation, Chicago, Ill., will display precision carbide and steel dies and its new, improved "Grind-All" fixture. Surface grinders will also be on display. Booth 1045.

Circle **622** on cards facing back cover

Three-cam reciprocating shuttle transfer to be shown by Expert Automation Machine Co.

Cam-Driven Shuttle Type Transfer System

A patented, completely mechanical, self-contained reciprocating shuttle transfer designed to combine high performance with efficiency and said to be foolproof will be introduced by the Expert Automation Machine Co., Detroit, Mich. Also on display at this company's booth will be a complete line of standard cam-indexing drives for dial, trunnion, over-and-under, and linear pallet type machines. Also featured will be over-and-under and linear pallet type transfer machines which provide fast, smooth, and shock-free precision indexing.

The shuttle transfer system illustrated utilizes the Expert cam-indexing drives in a multiple arrangement to achieve extremely rapid, accurate, and shock-free operations. Booth 2118 and 2119.

Circle **608** on cards facing back cover

Emhart to Introduce High-Speed Horizontal V & O Press

Highlighting the exhibit of the Emhart Mfg. Co., Hudson Division, Hudson, N. Y., will be a V & O 25-ton, extremely high-speed horizontal press with double-roll feed, stacking chutes, and scrap cutter. The design of this press incorporates a vertical crankshaft with the flywheel and clutch located in the base of the machine to obtain a low center of gravity. This unit will be particularly adaptable for strip-feeding from a magazine. Also displayed will be a packaged automated unit consisting of a V & O No. 2 open-back inclinable press, equipped with an F-3 (single-station) "Feed-O-Matic" and a vibratory hopper. Booth 1944.

Circle **633** on cards facing back cover

PRODUCTS

Skinner Electric Valve Division Will Display New Products

The Skinner Electric Valve Division, Skinner Chuck Co., New Britain, Conn., will display a number of three-way valves, one of which is shown in Fig. 1. The valves in this line, called the "A" series, are designed for use with medium-size cylinders. The "A" models bridge the gap between Skinner's three-way V-5 valves used with small cylinders and the three-way "L" series used with large cylinders. They are available in normally open, normally closed, directional control, and multiple-purpose styles. Orifice sizes are 3/32-, 1/8-, and 5/32-inch. Body ports are 1/4-inch NPTF and sleeve ports, 1/8-inch NPT. Maximum operating-pressure differentials up to 250 psi are possible.

Completing the "L" series two-way valves are two new types with 3/4- and 1-inch-diameter orifices of the design shown in Fig. 2. They are designed to control such common media as air, oil, and water and are small and compact. Maximum operating pressure differential is from 5 to 150 psi. NPTF threads of 3/4 inch are used with the 3/4-inch orifice and of 1 inch with the 1-inch orifice. Bodies are of forged naval brass. A unique diaphragm made of laminates of nylon and "Buna-N-rubber" is fully supported in both off and on positions, permitting exceptionally long trouble-free life.

The three-way L series high-flow, solenoid valves, like the one illustrated in Fig. 3, are ideal for general industrial use. They are designed to control such common media as air, water, vegetable and petroleum oils, inert gases, kerosene, and gasoline. These valves are light and compact, mount in any position directly in the line, and operate on a pressure differential of 5 to 150 psi. They are being introduced in 3/8-, 1/2-, and 3/4-inch full effective orifice sizes and are available normally open, normally closed, and with directional control in standard and explosion-proof construction.

A two-way "R" series solenoid valve is available in high-pressure models in two-way, normally closed construction and in a wide range of voltages and frequencies with many electrical options. The orifice is 1/4 inch in diameter, with 1/4-inch NPTF ports. Operating-pressure differentials are 5 to 1250 psi on alternating-current service and 5 to 1000 psi on direct-current service. Valves are designed for use with air, oil, water, and other common media. Internal parts are stainless steel and bodies are of forged naval brass. High-pressure models are available in both standard and explosion-proof construction. A spring-loaded plunger and piston assembly provides positive closing, permitting mounting in any position.

Compact two- and three-way valves designed to handle liquids or gases for control and instrumentation will also be shown. These V-5 series valves are made to handle 400-psi maximum operating-pressure differential. They have 1/32-inch orifices and 1/8- and 1/4-inch NPT ports. Two-way types are available normally closed and will seal in either direction. Three-way types are available in normally closed, normally open, directional control, and multiple-purpose versions. Booth 1338.

Circle **624** on cards facing back cover

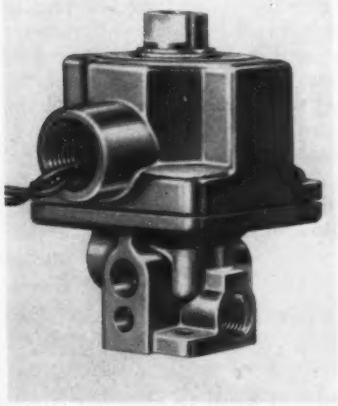


Fig. 1. Skinner "A" series three-way valve

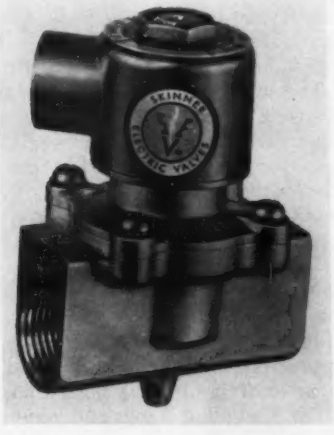
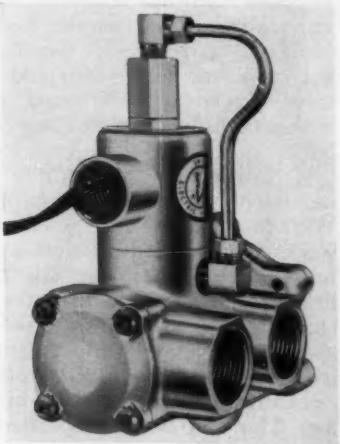
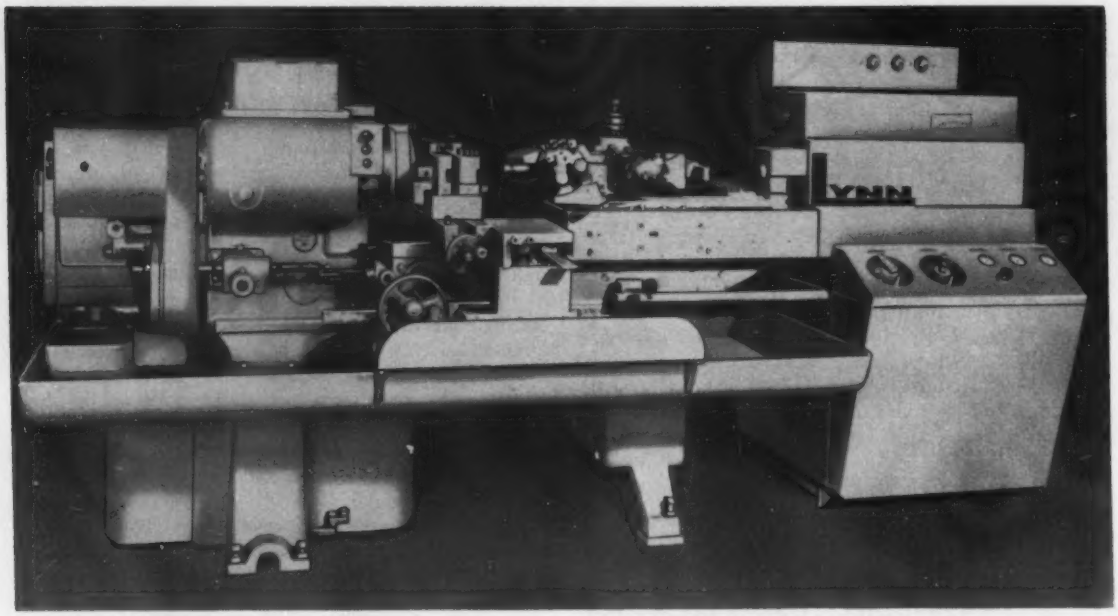


Fig. 2. "L" series Skinner two-way valve

Fig. 3. Three-way "L" series Skinner solenoid valve



PREVIEWS OF NEW



Ram type lathe converted to automatic production machine by Lynn hydraulic drive

Hydraulic Drive to Convert Turret Lathe to Fully Automatic Machine

A hydraulic drive designed to convert any ram type turret lathe to a fully automatic production machine will be exhibited by Lincoln Industries Co., Minneapolis, Minn. This "Lynn" drive has been developed to incorporate hydraulic and electrical control systems of the latest improved design. It is claimed that two or more machines automated by this equipment can be operated by one man. The drive provides for a full automatic cycle in performing such operations as turning, boring, deep-hole drilling, facing, undercutting, and forming. Provision is made for tapping and chasing both right- and left-hand threads. The drive also provides for rapid traverse, feed and dwell, reverse feed, and rapid return for indexing. It opens and closes the collet and also selects and engages the proper spindle speed for each station. In addition the drive automatically operates the regular cross-slide of the lathe.

A "Recipromatic" unit drills deep holes and removes chips by automatic reciprocation of the drill. With this unit the drill is advanced rapidly to the work. A preset feed then takes over for a predetermined drilling time. When this drilling time ends, the drill is rapidly backed from the hole to clear it of chips. It is then rapid-traversed back to the point where it previously stopped cutting, and the cutting feed is resumed. Both turret and cross-slide have direct-reading, infinitely variable hydraulic feed for each tool. The unit may be operated continuously or it may be stopped automatically at any or as many stations as desired.

The automatic cross-slide is independent of the operating ram and can be run simultaneously with the ram or the ram can be withheld. However, the ram and cross-slide cannot get out of phase with each other. Repetitive accuracy of plus or minus 0.0004 inch is obtained on cross-slide operations and plus or minus 0.001 inch on turret operations. Micrometer dial type screws are used for precise adjustment of the length of the forward or backward feed of the cross-slide. Graduated screws accurately control the length of the turret stroke. No part of the machine interferes with chucking or tool setting.

All drives are equipped with a back-feed attachment. This allows a finish cut to be taken on the return stroke. It also allows many operations to be performed by the turret which are normally done on the cross-slide.

Circle **645** on cards facing back cover

Federal Tool to Display Stampings

The Federal Tool & Mfg. Co., Minneapolis, Minn., will have a large display of standard short-run stampings and various metals and plastic materials. Specially featured will be parts produced by Federal's new "Combin-O" process. This short-run stamping process eliminates from one to four of the operations required by methods previously employed. Special stamping

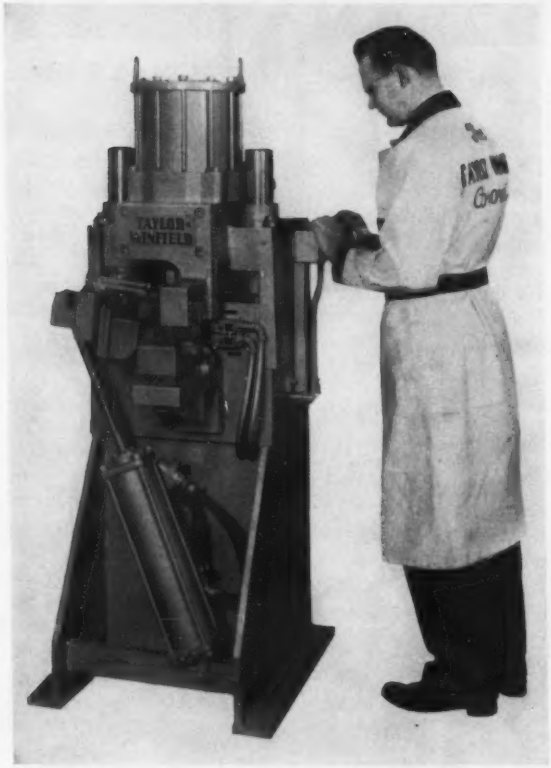
PRODUCTS

Bending Machine and Air-Operated Resistance Welder

The Taylor-Winfield Corporation, Warren, Ohio, will exhibit its tangent bending machine model 6 ASW 2. This single-wing, open-side type, air-operated machine, Fig. 1, is designed for rapid, light-duty bending of preflanged metal sheets. Inside, outside, or triple-fold flanges are maintained during the section-bending operation so that the product contours are strong, smooth, and free of wrinkles and buckles. The machine will be tooled to demonstrate two tangent bending operations on an anodized-aluminum channel section.

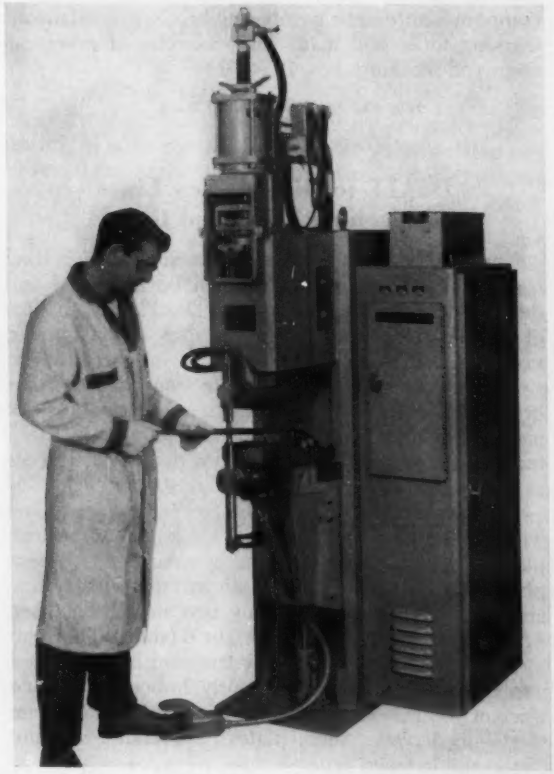
The Taylor-Winfield ENC model air-operated resistance spot welder, Fig. 2, will also be on exhibition. This press type welder is available in 30-, 50-, 75-, and 100-kva ratings. It has a roller-bearing-guided ram made of hardened semisteel which is jig-ground and of hollow construction. The ram is made light in weight in order to minimize inertia and provide rapid follow-up under any welding condition. The deep section of the ram from front to back minimizes deflection due to the welding forces normally applied. Four ground surfaces provide running support for eight antifriction bearings. There are four bearing rolls at the top of the ram and four more at the bottom. The rigid, cast semisteel head support is horizontally keyed and securely bolted to, but insulated from, the upper head extension of the frame. Thus it is unnecessary to insulate any special lower knee or worktables. Booth 1409.

Circle **641** on cards facing back cover



◀ **Fig. 1. Taylor-Winfield tangent bending machine**

Fig. 2. ENC model air-operated resistance spot welder ▼



Made by "Combin-O" Process

dies enable a number of forming operations to be combined in one. One stamping which formerly required seven operations is now completed in three. One which required five operations is now done in two. There are considerable time savings which, of course, are reflected in lower stamping costs. Booth 950.

Circle **630** on cards facing back cover

Noblewest Metal-Marking Equipment

The Noble & Westbrook Mfg., East Hartford, Conn., will show a large line of its newest production marking equipment in the Noblewest "MARK-O-RAMA" exhibition booth. One of the outstanding exhibits will be the versatile Model 50P1 roll marking machine. This pneumatically operated, general purpose roll marking machine marks round or flat workpieces at speeds up to 1500 pieces per hour.

For the first time, the company will exhibit its circular graduating machine. This latest addition to the Noblewest line is capable of performing a wide range and number of graduating operations, including all commonly used English, metric, and "degree" graduating. This equipment has cutting speeds of approximately 145 to 180 graduations per minute, and will graduate pieces from 1 1/2 to 20 inches in diameter.

Another feature of the exhibit will be the Series 19, Model 501 rapid-production vertical dial-marking machine, tooled for marking manufacturers's identification and sizes on high-speed-steel twist drills. The machine is equipped with a gravity feed chute, which can be manually loaded or hopper fed, making the entire operation semi-automatic.

A Series No. 9 bench model all-pneumatic roll marking machine and a Model 450 air marking press of 7 1/2-ton capacity will also be exhibited. Rounding out the exhibit will be representative models of the company's automatic numbering heads, miscellaneous marking tools, and many fine examples of precision-engraved marking dies. Booth 1446.

Circle **616** on cards facing back cover

Noblewest Roll-O-Mark metal-marking machine

DoALL to Display New Lines of Machine Tools and Gages

New and redesigned lines of machine tools, cutting tools, and gaging instruments will be displayed and demonstrated by the DoALL Co., Des Plaines, Ill. One of the new machines will be an angle-cutting power saw, Fig. 1. The entire sawing head of this machine swivels to cut work at any angle from 90 to 45 degrees. This machine also features an automatic stock index-table that makes cuts of any length up to 24 inches and automatically continues to produce pieces of this length as long as the stock lasts.

Another product to be exhibited for the first time will be DoALL's double-faced black granite surface plate, Fig. 2. Available in all standard sizes, these plates may be finished with both surfaces of the same grade or a combination of any two standard grades, AA (laboratory), A (inspection), or B (shop). They can be turned or handled easily by trunnion bolts screwed into threaded inserts permanently imbedded in two sides of the plates. Costing only one-third more than single-faced plates, these plates have double the life of the single-faced type.

Fig. 1. DoALL angle-cutting power saw

On view at the show will be DoALL's new stainless-steel gage-blocks (Fig. 3) which are claimed to be superior to regular steel gage-blocks in several respects, including greater hardness, corrosion resistance, and stability and longer life.

PRODUCTS

Fig. 2. Double-faced black granite surface plate

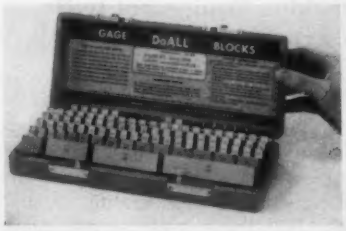


Fig. 3. DoALL stainless-steel gage-blocks

Fig. 4. DoALL hand grinder with hydraulic table control

Another machine to be exhibited is the versatile hand grinder, Fig. 4. This DoALL grinder has a hydraulic table control available as an attachment. Operating either manually or hydraulically, this machine can double on either toolroom or production runs. Its height is adjustable to the operator's convenience and the handwheel can be used on either the left or right side of the saddle, as desired.

One model each from the "Contour" and "Contour-matic" lines of DoALL band saws will also be exhibited. These machines have been completely redesigned during the last year to incorporate many new features that extend the economies of band machining in both the toolroom and on the production line.

A special display will include more than 1500 kinds of DoALL cutting tools and gaging instruments. Included will be such recently introduced items as vanadium end mills, "hy-spiral" taps, radial design center drills, "Econo-Bore" counterbore, and miniature cutting tools. Booth 1226.

Circle **643** on cards facing back cover

"De-Sta-Co" Toggle Clamps

Three plunger type toggle clamps and an expanded and improved line of miniature and pneumatically operated clamps will be the featured display of the Detroit Stamping Co., Detroit, Mich. Models 601 and 601-0, designed principally for general-purpose use in light assembly work of the electronics, aircraft, and allied industries will be on display. Both of these "De-Sta-Co" clamps lock in either an extended or retracted position. Model 601, Fig. 1, has a tapped hole in the plunger to take a rubber-tipped adjustment spindle and a lock-nut for extending or shortening its reach. The Model 601-0 has a 1/4-20 thread on the plunger end to allow easy positioning of various holding devices. The rated holding pressure of both clamps is 95 pounds.

The Model 606, Fig. 2, with a rated holding pressure of 450 pounds for medium-duty holding applications, features a swiveling handle and a narrow base for use where clearance requirements do not permit the use of conventionally designed clamps. The handle swivels in a 220-degree arc and can be fixed in any position within this arc by a lock-nut located on the axis of rotation. A tapped hole in the plunger permits an adjusting spindle to be used to extend the reach of the plunger.

Base-mounting holes on all three clamps are located in a manner to facilitate positioning the clamps on standard tooling and aircraft-industry assembly plates. In addition to the featured display, the exhibit will contain the entire line of standard clamps, spacing products, and stampings made by the company. Booth 1054.

Circle **634** on cards facing back cover

Fig. 1. De-Sta-Co rubber-tipped clamp

Fig. 2. Model 606 De-Sta-Co clamp

Die and Toolmaking Equipment to Be Exhibited by Producto Machine Co.

The Producto Machine Co., Bridgeport, Conn., will demonstrate a number of new products for the toolroom, including the portable "Die Assembler," Model 1, shown in Fig. 1. This machine is designed primarily for pulling apart upper and lower die assemblies. It simplifies aligning of punches to dies, mating of die components during the initial stages of die manufacturing, and speeds repair work.

The lift table and upper platen of the assembler have an arrangement for speedy clamping and unclamping. The lift table is hydraulically actuated and develops a 3000-pound closing force and 1500-pound separation force, enabling the toolmaker to obtain impressions on punches or dies for final machining. Movement of the table varies from 0 to 30 inches per minute and is valve-controlled for fine up or down movements. The upper platen can be locked in position or revolved 360 degrees and can be easily rotated by a geared hand-control wheel. The unit has a battery-driven motor pump with self-contained charging unit. Casters facilitate portability, and the absence of trailing electrical extensions allows safe mobility in cramped areas.

The "Versa-Tap," Fig. 2, a new machine for hand tapping, features an articulated spindle arm which allows access to all areas of the square work-table as well as off-the-table areas at the back of the machine. The overarm is instantly adjustable vertically from minimum to maximum height when tapping irregular-shaped parts. The tapping-spindle assembly has a preloaded ball-bearing system that allows linear and rotary movement which is counterbalanced by spring loading. This exclusive feature imparts a sensitive feel when using small fragile taps, and reduces thread lead distortion. Tapping range is from No. 8 to 3/4-inch standard and 1/8- to 1/2-inch pipe taps which are held in 1-inch-diameter hardened and ground individual tap-holders.

The 22-inch-square semisteel table has five 5/8-inch cast T-slots which are pitched to the center of the table to conduct oil and chips to a removable pull-out drawer.

Also to be demonstrated is the Williams Model F-4 "Roto-Recipro" toolmaking machine, Fig. 3, now being manufactured by Producto. A unique feature of the machine is its ability to simultaneously rotate and reciprocate cutting tools. Thus, in addition to conventional machining, the Roto-Recipro can perform machining operations in which a stylus and templates are used to duplicate irregular and contoured die, punch or formed part shapes. A deep-throat frame allows machining to the center of a 22-inch circle.

A dowel-pin assortment kit, Fig. 4, contains ten each of sixteen of the most frequently used dowel-pins. Sizes range from 1/2 inch in length and 1/8 inch in diameter to 2 inches in length and 1/2 inch in diameter. The dowel-pin kit has been developed to save time-consuming trips to the stockroom. Dowels are contained in separate compartments for easy selection. A lift-out tray reveals the bottom section. The box lid has a diagram that shows the location of each size of dowel.

A 1/2-hp variable-speed motor with a speed range of 10,000 to 45,000 rpm and infinitely adjustable stroke length of 0 to 5 inches, infinitely variable speed range of 85 to 500 strokes per minute, and a table which is inclinable 10 degrees in four directions with a 5-inch vertical adjustment are standard features of this machine. The table is 18 inches square and is fluted for easy chip removal. Booth 1144.

Circle **642** on cards facing back cover

Fig. 1. Producto Die Assembler

Fig. 2. Versa-Tap machine

Fig. 4. Producto dowel-pin kit

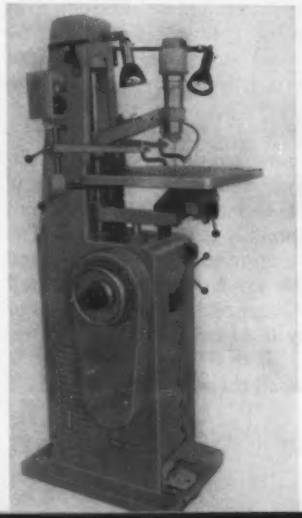


Fig. 3. (Left) Roto-Recipro toolmaking machine

PRODUCTS

Truarc "Ring-O-Mat" Assembly Machine

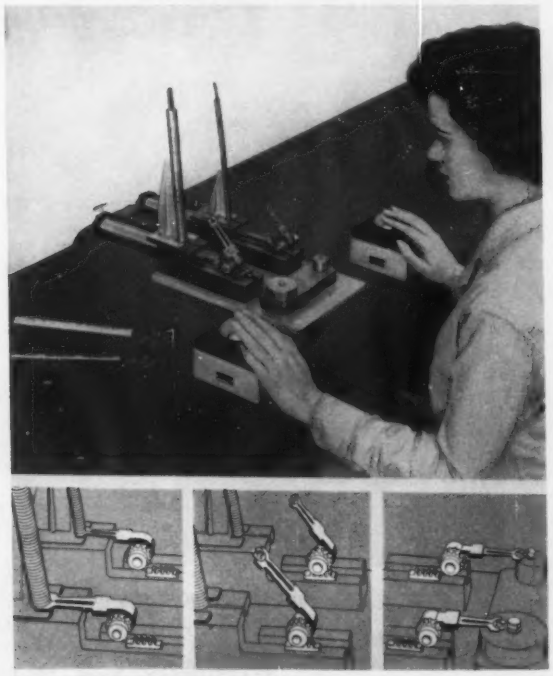
A Truarc "Ring-O-Mat" assembly machine, developed by Waldes Kohinoor, Inc., Long Island City, N. Y., will be introduced at the show. This equipment is designed for high-speed, mass-production assembly of radially installed Truarc Series 5103 crescent rings, Series 5133 E-rings, and Series 5144 reinforced E-rings. Rapid loading with stacked rings supplied in the tape-wrapped "Rol-Pak" cartridges shown in the illustration assures a constant supply of the fasteners.

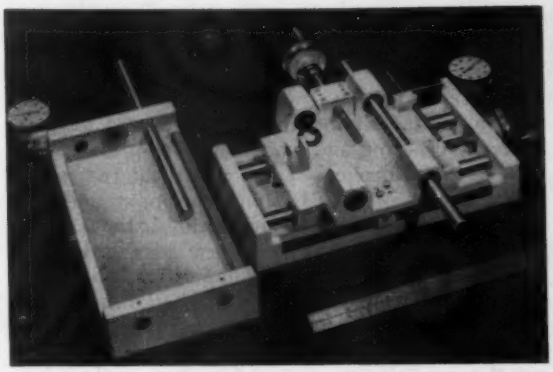
The unit shown was designed to install two rings simultaneously in the roller assembly in front of the operator. A Series 5144 ring is used to secure the large roller to the baseplate; a smaller Series 5133 ring fastens the roller at the right.

To install the rings, the operator first places the work-piece on a nest in the fixture. The machine can be activated either by a foot pedal or the hand controls shown. When the mechanism is started, the applicating tools grasp the bottom rings on the dispenser brackets, swing through an arc of 180 degrees, and then move forward to assemble the rings on the roller studs, as shown diagrammatically by views at the bottom of the illustration. Once the rings have been installed, the applicators flip back automatically to grasp new rings from the dispensers When the work-piece is removed from the nest and another substituted for it, the operation is repeated. Booth 1861.

Circle **661** on cards facing back cover

(Top) Truarc "Ring-O-Mat" assembly machine. (Bottom) Diagrams illustrating operation of "Ring-O-Mat"





Two-way adjusting compound work-holding and locating fixture to be shown by Tracer Control Co.

"Duplimatic" Tracer Attachment

The Tracer Control Co., Hazel Park, Mich., will exhibit their "E" series "Duplimatic" tracer attachment. This unit is designed to automate or equip milling machines, lathes, boring mills, etc., for automatic and pencil-trace machining. Duplimatics can operate in two or three dimensions and maintain precision tolerances at speeds limited only by the capabilities of the machine tool.

Also shown will be a new two-way adjusting compound for precision holding and locating of work-pieces. Dial indicators and adjusting rods compensate for backlash and allow adjustments to tolerances of 0.0001 inch. Other products to be exhibited include: a standard hydraulic probe unit designed for single-axis tracing, and a two-speed precision gear-box that can be used with either hydraulic or electric motors. Booth 2220.

Circle **650** on cards facing back cover

Bausch & Lomb to Feature "StereoZoom" Microscopes

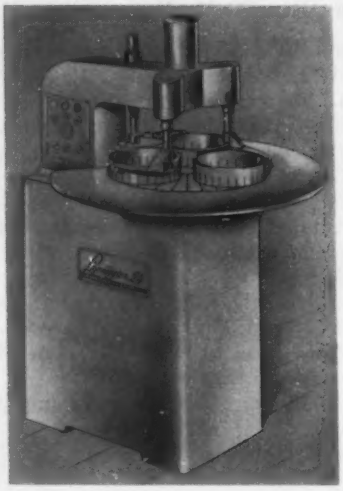
The Bausch & Lomb Optical Co., Rochester, N. Y., will feature the entire line of new "StereoZoom" microscopes at the show. Additional new products to be introduced include a new scratch depth gage, die-wear microscope, and universal staging fixture for both the bench comparator and standard toolmaker's microscope. A highlight of the exhibit will be a Stereo-Toolmaker's measuring microscope, featuring the new "Power Pod" concept, and depth measuring attachment. In addition to new instruments, the B&L exhibit will include the DR-25 optical gage (with new features), the bench comparator, and a complete line of accessories. Booth 630.

Circle **654** on cards facing back cover

Lapping Machine with Flatness Control to Be Introduced by Crane Packing Co.

The Lapmaster Division of Crane Packing Co., Morton Grove, Ill., will introduce a new control for automatically checking and maintaining lap-plate flatness. This electromechanical device, to be featured for the first time on a Model 24 Lapmaster lapping machine, assures automatic quality control within extremely close tolerances. It incorporates an exclusive three-point sensing head capable of detecting errors in lap-plate trueness within one light band (0.0000116 inch) on a 3-inch section. If errors are present, the control unit operates an electric motor drive, automatically shifting the conditioning rings inboard or outboard to compensate for any work wear pattern on the lap-plate, thus eliminating the need for any manual checking and adjustment.

The Model 24 Lapmaster pumps lapping compound and vehicle under pressure onto the lap-plate, assuring efficient distribution over the entire work area. The machine is made compact to permit operation in a small space. A large work-table surrounds the plate to facilitate loading and unloading. As with all Lapmasters, the shape or form of the part presents no problem. Monel, steel, tool steel, bronze, cast iron, stainless steel, aluminum, magnesium, brass, quartz, ceramics, plastics, and glass can be lapped on a production basis within tolerances of one light band or less. Finishes of 2 to 3 micro-inches are said to be obtained with absolute uniformity. Booth 420.



Crane lapping machine equipped to automatically check and control lap-plate flatness.

Circle **626** on cards facing back cover

Temperature-Controlled Testing Chamber

Cincinnati Sub Zero Products, Cincinnati, Ohio, will demonstrate a multiple-purpose Model A-120-5 temperature-controlled chamber engineered especially for the show. This electrically operated equipment is equally adaptable to metallurgical applications and special testing. For production chilling, a convection fluid can be used in the chamber to facilitate chilling of small parts. When special tests are necessary, an air circulator in the lid provides mechanical air convection to minimize temperature variation and maintain close temperature control. The operating range is from plus 70 to minus 130 degrees F.

Exterior dimensions of the unit are: length, 40 inches; width, 32 inches; and height, 44 inches. The chamber is 30 inches long by 18 inches wide by 16 inches deep. This equipment is of all-steel unitized construction and the exterior is finished in gray lacquer. It is completely portable and mounted on four swivel casters.

The cascade refrigeration system is designed to provide maximum operating efficiency at nominal cost. The unit can be disconnected from service for use in various plant areas without loss of refrigerant. A wide range of applications is possible with the accessory features which include an 8- by 16-inch window, interior illumination, indicating-recording controller, and air circulator. The lid is full-opening and counterbalanced. Heaters can also be adapted to this model, if required, for high-temperature tests. Similar models have been supplied for stabilization of steel, stress relief of aluminum, dehydration of gases, research, laboratory and medical use, storage of biological products, and other applications. Booth 409.

Circle **637** on cards facing back cover

Multiple-purpose chamber from Cincinnati Sub Zero Products

PRODUCTS

Boggis Tap-Sharpening Equipment

The Henry P. Boggis Co., Cleveland, Ohio, will exhibit its complete line of grinders and fixtures for sharpening and reconditioning taps. The improved Model 1100 grinder will sharpen chamfers, flutes, and spiral points and has capacities from No. 6 machine screw to 2 1/2 inch hand taps. All taps are held by the shank so that they can be reconditioned after the center has been destroyed.

The Model 1400 grinder, which sharpens chamfers only, is unique in that a dust-sealed trunnion action replaces conventional dovetail slides for feeding the 6-inch-diameter grinder wheel.

The new sizes K and L chamfer- and flute-sharpening heads have increased capacities and feature quick-change cam-pin plates, making it possible to sharpen taps with any number of flutes. The variable pitch cam in the chamfer head is calibrated for accurate settings which will produce definite relief on the chamfer.

The HYBCO Model 2100 two-way relieving fixture will be shown for the first time. Both radial and axial relief can be obtained in conjunction with each other or independently. Unique adjustments provide a variable amount of relief which can be measured by dial indicator. Maximum collet capacity of the head is 1 1/16 inches and a 4-inch six-jaw adjustable chuck can be furnished. Booth 818.

Circle **640** on cards facing back cover

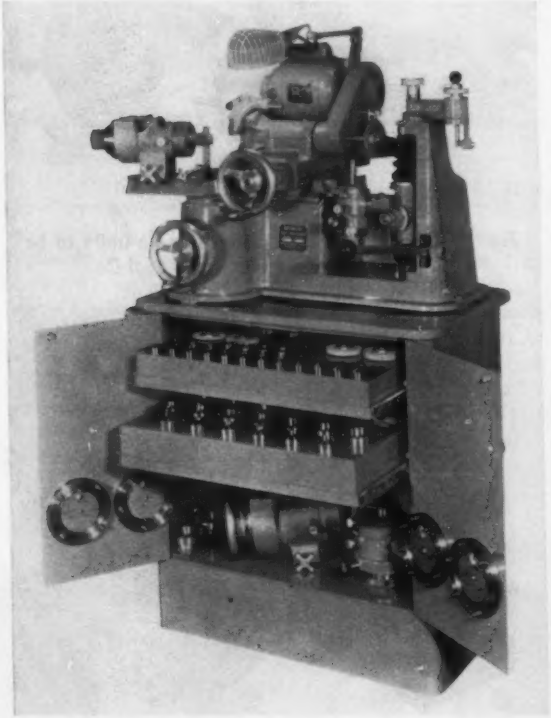


Fig. 1. Boggis Model 1100 tap grinder

Machinable Carbides to Be Exhibited

"Ferro-Tic S," a new machinable stainless steel-bonded carbide, will be featured by the Sintercast Division of Chromalloy Corporation, Yonkers, N. Y. Temperature and corrosion-resistant tools and parts may be fabricated from the new material by using conventional tools, instead of diamond grinding wheels. Two grades of Ferro-Tic S are available, having a hardness of Rockwell C-45 or C-55.

The stainless steel-bonded carbides are additions to Sintercast's line of Ferro-Tic C heat-treatable, machinable, cemented carbides. Machinable blanks of stainless-steel carbide are produced by powder-metallurgy techniques. Crystals of titanium carbide are embedded in a relatively soft matrix of stainless steel, then sintered. The blank retains the desirable properties of both of its constituents: stainless steel's resistance to heat and corrosion, and titanium carbide's ultra-hardness. Machinability of Ferro-Tic C, as well as that of both grades of Ferro-Tic S, will be demonstrated at the show. Booth 110.

Circle **632** on cards facing back cover

Fig. 2. Model 1400 Boggis tap grinder

Block-lined furnace for hardening tool steel

Sentry Electric Furnace

Sentry Co., Foxboro, Mass., will operate a new Model Y electric furnace, demonstrating scale-free, decarburization-free hardening of molybdenum high-speed steel. A positive, protective atmosphere is created within the furnace work chamber by the company's diamond blocks. The atmosphere requires no adjustment or special operator skills. Tools can be soaked to assure full hardness without danger of surface deterioration. Show visitors are invited to bring samples of their high-speed-steel tools for on-the-spot demonstration hardening. Booth 2027.

Circle **673** on cards facing back cover

Standard Electrical Tool to Display Building-Block Equipment

The Standard Electrical Tool Co., Cincinnati, Ohio. will demonstrate the "endless versatile variations" of their "building-block" equipment. "Tooling for productivity" is said to be made easy with this line of precision spindles assembled with a complete range of attachments consisting of single or compound feeds, swivels, one-axis or two-axis tables, wheel guards, belt guards, balancing type wheel holders, work spindles, and various other units. Precision spindles of motorized or independent drive or piggy-back design serve either as a work-head or as individual design units for grinding, milling, drilling, boring, etc.

One type of work-spindle with a 20-inch-diameter table for work loading or with a 10-inch-diameter internal-taper work-holding arrangement is shown at (1) Fig. 1. A precision milling spindle with No. 30 NMTB nose assembled piggy-back with an air motor and timer-belt drive to delivery infinitely variable speeds is shown at (2).

Views 3, 4, and 5, Fig. 1, illustrate precision grinding spindles, any of which will accommodate the pulley/sheave and balancing type wheel-holder with

Fig. 1. Building-block precision spindle units to be shown by Standard Electrical Tool Co.

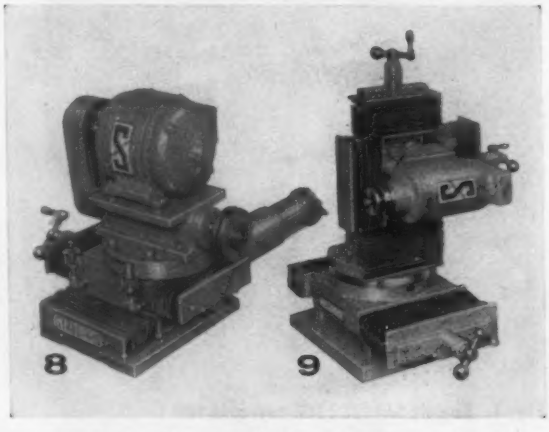


Fig. 2. Spindle assemblies with compound feed incorporating building-block units

PRODUCTS

balancing weights for grinding wheels up to 40 inches in diameter. The integral platform of the unit in View (3) accommodates the piggy-back assembly of an electric motor as a package unit. View (6) illustrates the versatility of attachment selection, consisting of a compound feed with micrometer dials and a 360-degree swivel base supporting the motorized precision spindle. The precision spindle of individual design, View (7), will serve practically any machine tool either as a replacement spindle or for modernizing the machine. This is a complete motorized spindle assembly with pivot-bracket and graduated swivel base for a No. 2 Cincinnati tool and cutter grinder.

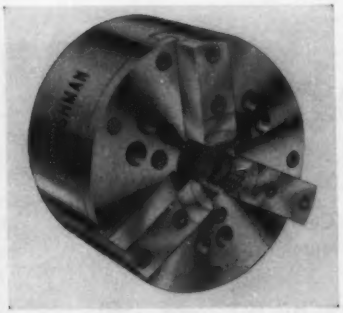
Typical independent selectivity in building-block assembly is demonstrated by the units shown in Views (8) and (9), Fig. 2. View 8 shows the compound feed with accordion way protectors and manual cross-feed on power traverse. Assembled thereon is a 20-degree swivel base with piggy-back motorized timer-belt drive to the precision spindle, with holder for grinding wheel. The assembled unit, View (9), has accordion way covers on all feed slides. The motorized grinding spindle has the wheel-holder supported vertically on a 360-degree swivel base with cross-feed as an integral part of the vertical feed. This assembly is secured on a 360-degree swivel base, supported on a lateral hand feed with a large-area foundation base. Booth 1430.

Circle **667** on cards facing back cover

Chucker Chuck Introduced by Cushman

An air-operated chuck designed especially for use on automatic chuckers is being introduced at the show by the Cushman Chuck Co., Hartford, Conn. Said to incorporate many advantages heretofore unavailable in work-holding devices used on automatic multiple-spindle machines, this chuck features a small over-all diameter with an exceptionally large bore capacity and an unusually high lever ratio of 6 to 1. In addition to ample cross section for strength and precision performance, the jaw bearing surface is in line with the work-piece grip. All chuck surfaces are hardened and ground except for the soft face and flame-hardened ways. Booth 1021.

Circle **674** on cards facing back cover

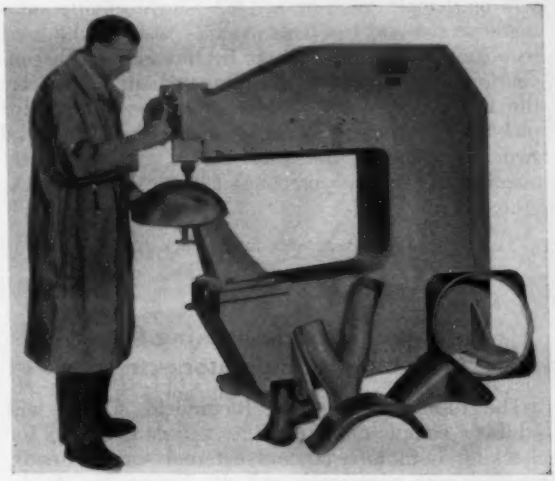


Cushman air-operated chuck

Trimmer for Deep-Drawn Parts

A heavy-duty trimmer designed for edge-trimming and finishing operations on bulky stampings and deep-drawn parts will be a feature exhibit of the American Pullmax Co., Inc., Chicago, Ill. This machine operates with a stationary lower tool and a reciprocating upper tool that leaves a clean edge requiring no further finishing. The maximum throat clearance is 23 inches.

The trimmer has a capacity of 7/32 inch in mild steel. Accessories can be added to it so that all standard operations can be performed. These include:



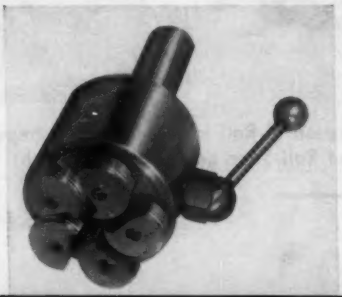
Pullmax trimmer for stampings and drawn parts

straight, circle, inside, irregular, slot and louver cutting, as well as beading, edge-bending, flanging, and dishing operations. Other models of the Pullmax machine will also be on display with cutting capacities ranging from 1/16 up to 13/32 inch in mild steel. Booth 827.

Circle **638** on cards facing back cover

Five-Chaser Threading Heads

The Threading Tool Division of the National Acme Co., Cleveland, Ohio, will feature a new line of standard five-chaser Vers-O-Tool threading heads. The various uses and advantages of these new tools will be shown by means of display tables equipped with trans-



Vers-O-Tool five-chaser threading tool

lites and actual work samples. The basic theme of the display will be based on "more truly round threads." Among the several advantages claimed for these five-chaser heads are: more finished pieces per grind while precision threading over flats, keyways, slots, drilled holes, and undercuts; elimination of out-of-round and drunken threads; reduction of lead error, taper, and grooves on the thread flank; maintenance of correct relation between tool and work at all times because of rigid five-point contact; and the ability to meet the requirements of the latest improved gaging methods and standards.

The actual operation of five-chaser Vers-O-Tools will be demonstrated on a B.S.A. single-spindle automatic screw machine. This machine also will be used to obtain comparative results by threading with conventional heads and thread-rolling with an Acme-Fette thread-rolling head. In addition, it will be arranged for pick-up and back-threading. Also on display will be switches, solenoids, and push-button control stations, manufactured by the company's Electrical Controls Division. Booth 1939.

Circle **653** on cards facing back cover

Johnson Thread-Checking Gages and Comparators

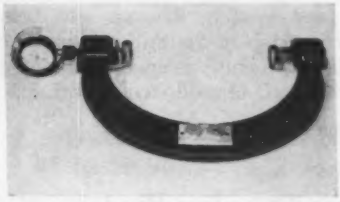
The Johnson Gage Co., Bloomfield, Conn., will exhibit a complete line of gages and comparators for checking both internal and external screw-threads, together with accessories and attachments for checking the concentricity and squareness of related surfaces. Roll and segment type gages and comparators will be shown for both internal and external thread checking. These are the company's conventional "Ring-Snap," "Roll-Snap," and "Tri-Roll" fixed and indicating models. The pivotal plug-snap gage and comparators for internal thread checking will be featured.

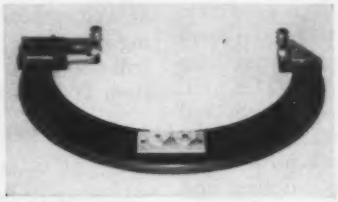
The "Bi-Roll" external thread comparator, Model 450-X, Fig. 1, is made to cover a 2-inch measuring range and in sizes from 6 to 30 inches. It is usually equipped with Johnson Type CAE rolls which are flatted to the pitch line to enable ready setting to size blocks or a setting bar, thus eliminating the need for thread plug gages. Rolls of different pitches are interchangeable on the same frame.

The adjustable Roll-Snap gage, Model RR-X, Fig. 2, has a 2-inch range in each frame and is built in sizes from 6 through 30 inches. This gage has all of the technical advantages of the Johnson Roll-Snap gage, Model RR, plus the range adjustment. When equipped with Type CAE rolls flatted to the pitch line, the gage can be set with size blocks or a setting bar, thus eliminating setting thread plug gages.

Johnson adjustable external Tri-Roll thread comparator, Model 230-X, Fig. 3, embraces all features of the Model 230 for three-roll gaging of large-diameter threads, plus the feature of a 2-inch range through interchangeable cradles and roll-slide arms. It is offered in sizes from 6 through 30 inches.

The Bi-Roll internal thread comparator, Model GG-C200, and accessories, Fig. 4, is said to be the most flexible and universal inside thread comparator equipment on the market and is usually equipped with Type CAE rolls which are flatted to the pitch





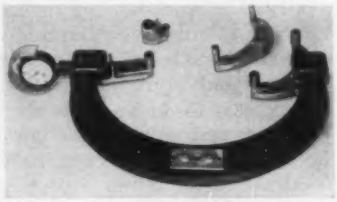
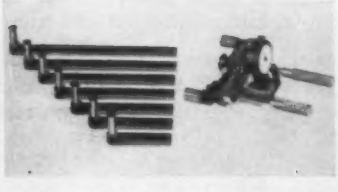


Fig. 1. (Left) Johnson Bi-Roll external thread comparator. Fig. 2. (Center) Adjustable Roll-Snap gage. Fig. 3. (Right) Johnson external Tri-Roll thread comparator.



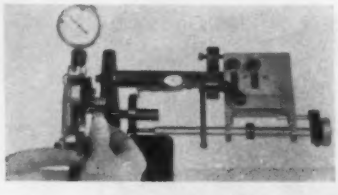


Fig. 4. (Left) Johnson Bi-Roll internal thread comparator and accessories. Fig. 5. (Center) Combination thread ring and Roll-Snap gage. Fig. 6. (Right) Universal concentricity and squareness attachment.

PRODUCTS

line to enable ready setting to correct pitch diameter without using master thread ring gages. Various (length) arms, shown at left, in 1-inch increments are adaptable to the body, thus providing for the rapid checking of internal threads from 4 1/4 to 30 inches.

The combination thread ring gage and Roll-Snap gage, Model A-SR, Fig. 5, is a combination of an AGD standard thread ring gage and "not go" gaging rolls. This gage provides the basically correct method of assuring that a screw thread is not larger than the "go" (assembleability) size, and that the pitch diameter is not smaller than specified.

The universal concentricity and squareness attachment EG-100, Fig. 6, can be mounted for either right- or left-hand, external or internal, as well as various combinations of concentricity and squareness checking of screw thread with related surfaces. It pivots out of gaging position to permit ready loading and unloading of parts to be checked. Booth 331.

Circle **663** on cards facing back cover

Ross All-Air Press Circuit and Two- and Three-Station Manifolds Mounted with Pacer Valves

Visitors to the booth of the Ross Operating Valve Co., Detroit, Mich., can operate an all-air circuit controlling a 5-ton press, Fig. 1, equipped with friction type clutch brake. Featuring a non-tie-down valve and a single-stroke valve, this unique circuit is operated by pressing two palm button valves. These valves are designed to improve operator safety by requiring two-hand operation. The circuit also includes control of single-stroking, inching, continuous cycling, top-of-stroke and emergency stopping. Any or all of these valves may be added to provide a complete Ross all-air press circuit.

Two- and three-station manifolds mounted with Pacer valves will also be displayed. This arrangement provides a compact, economical method of multiple mounting these recently introduced air valves. Supply line, electrical conduit, lubricator, and filter serve all Pacer models, with a reduction in piping and conduit. Booth 1255.

Circle **679** on cards facing back cover

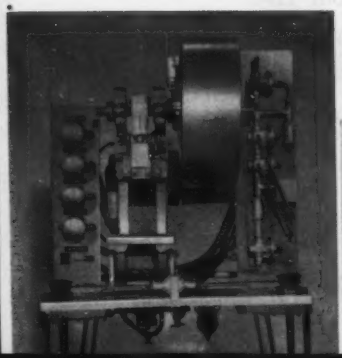


Fig. 1. (Left) Five-ton press with clutch controlled by Ross air circuit

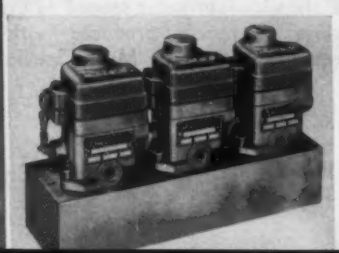


Fig. 2. Ross three-station manifold mounted with Pacer valves

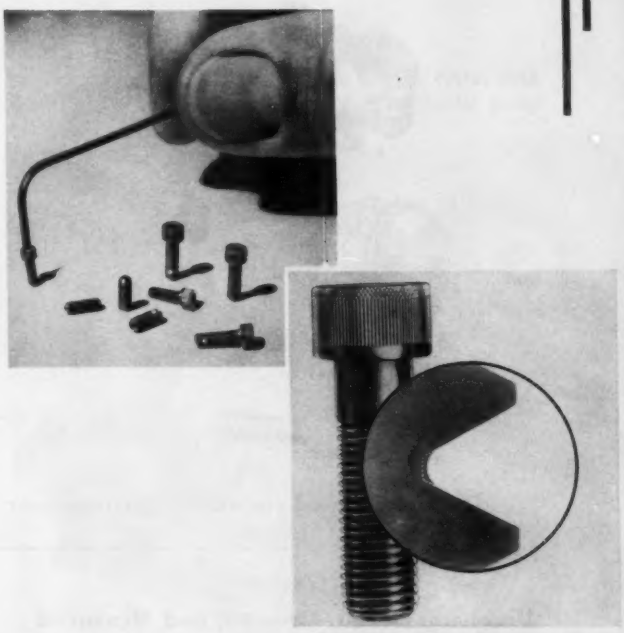


Fig. 1. (Right) Improved socket screw introduced by Standard Pressed Steel Co., and Fig. 2. (Left) Self-locking socket screws

Automatic Screw-Setting Equipment and New Socket Screws

A "Setomatic" unit designed to drive up to 2500 set-screws an hour will be featured by the Standard Pressed Steel Co., Jenkintown, Pa. This high-speed unit can be employed as an attachment for a single machine or as a building block unit in a completely automated production line. It automatically feeds, inserts, and tightens to predetermined torque hexagon socket set-screws ranging in size from No. 4 up to 3/8 inch in diameter and in lengths up to 3/4 inch.

The company will also have on display socket screws which have significant improvements in both head and thread. These screws, like the one shown in Fig. 1, have increased bearing area under the head and a larger wrench socket. The "Hi-Life" thread on these screws has a smooth, radius-formed root which blends smoothly into the flanks of the thread as shown in the inset view, Fig. 1.

A complete line of self-locking socket screws of the kind shown in Fig. 2 will also be exhibited. These Unbrako socket screws with the Nylok feature make use of a compressible nylon pellet to insure positive holding power despite shock and severe vibration. Booth 515.

Circle **636** on cards facing back cover

PREVIEWS OF NEW

Standard Electrical electrolytic conversion units

Spindles for Electrolytic Machining

Standard Electrical Tool Co., Cincinnati, Ohio, will exhibit its line of "Super Precision" spindles which are being adapted to new and existing machine tools for removing metal electrolytically. This technique is finding wide use in the missile and rocket program, for cutting solid and honeycomb materials, as well as for grinding milling cutters and carbide drills. The illustration shows some of the conversion units on display: (1) spindle and slip ring for a cylindrical grinder with a 300-ampere supply, (2) spindle and slip ring for a tool and cutter grinder with a 150-ampere supply, (3) high-speed (25,000 rpm) attachment for a surface grinder, (4) spindle and slip ring for a milling machine with a 600-ampere supply, and (5) motorized spindle with 300-ampere supply for a surface grinder.

Circle **670** on cards facing back cover

Precision Bored, Ground, and Measured Four-Hole Plate to Demonstrate Accuracy of Moore Equipment

The four-hole plate shown in the illustration will be exhibited by the Moore Special Tool Co., Bridgeport, Conn., as an outstanding example of the accuracy achieved by recently developed Moore precision machine tools and equipment. This equipment includes the Model No. 3 jig borer described and illustrated in January 1959 MACHINERY, page 184; the jig grinder announced on page 161 of March MACHINERY; and the universal measuring machine described and illustrated on page 158 of February 1959 MACHINERY. After the four holes were bored in the plate on the jig borer, the plate was ground on the jig grinder. The locations were then checked on the universal measuring machine by five men with the results inscribed on the plate itself. The initials opposite the respective measurements are those of the five men who inspected the plate. The maximum difference between all the measurements is only 30 millionths of an inch. The metalworking machines and the measuring machine employed in producing the plate shown in the illustration will all be included in the line of Moore equipment to be exhibited at the show.

Extraordinary precision, far beyond the former limitations of ten-thousandths of an inch, and a complete incorporation of calibrations in the new standardized International Inch, are features of these new model jig borers, jig grinders, universal measuring machines, and rotary tables like the one illustrated and described in May 1959 MACHINERY, page 170. These Moore tools are said to be the first American machines to adopt the new International Inch, which became standardized this past July throughout all English-speaking countries. Booth 1105.

Circle **664** on cards facing back cover

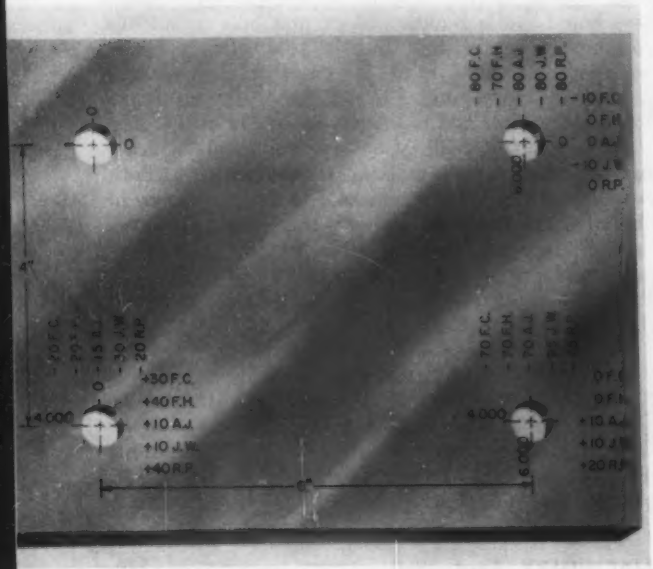


Plate with four holes spaced to exceptionally close tolerances produced with precision equipment made by Moore Special Tool Co.

PRODUCTS

Natural Diamond Grit

New SND natural diamond grit will be highlighted in the display of the Industrial Diamond Division of Engelhard Industries, Inc., Newark, N. J. In contrast to conventional diamond grit, the newly offered abrasive contains a preponderance of needle-like particles, which are shown by extensive tests to dramatically increase grinding efficiency of resin-bonded wheels in certain types of applications. Conventional natural diamond material also will be featured in the display. Booth 2144.

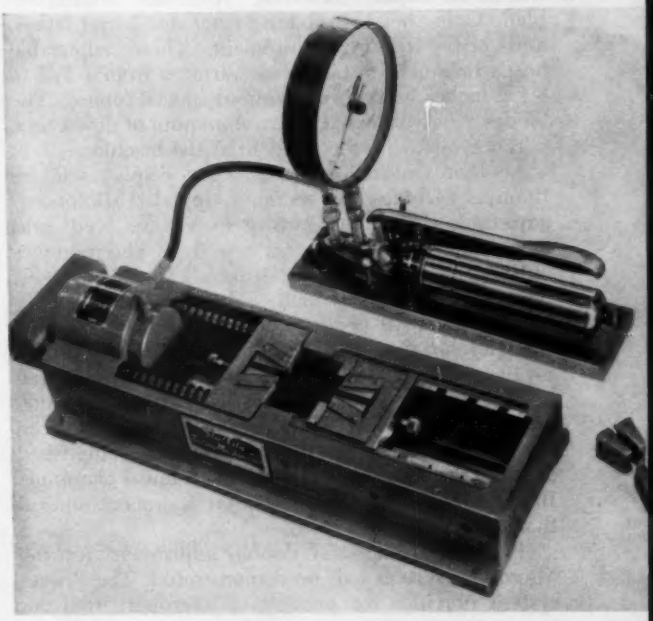
Circle **665** on cards facing back cover

Steel City Testing Machines

Equipment featured by Steel City Testing Machines, Inc., Detroit, Mich., will be new tensile-testing machines and units that can be incorporated in automatic production lines. Physical-property testers will be operating to show how to simplify material inspection and automate inspection procedures. Also on exhibit will be equipment for determining hardness and ductility, and proving rings. Booth 1526.

Circle **669** on cards facing back cover

Portable tensile tester with manual hydraulic pump



Full-Form Finishing Broaches

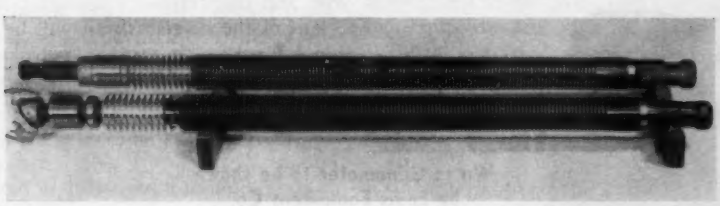
Red Ring full-form finishing broaches for producing precision internal spur and helical gears and splines in a single one-pass operation will be displayed for the first time at the show by the National Broach & Machine Co., Detroit, Mich. Full-form finishing broaches are a combination design consisting of a roughing broach and a removable shell type finishing section. These tools are said to cut costs for producing ultra-smooth, ultra-precision gears or splines by avoiding separate roughing and finishing operations.

Also on display will be an assortment of Red Ring gear tooth honing tools for improving the sound characteristics of hardened gears. These hones are abrasive-impregnated, helical gear-shaped tools that remove nicks and burrs, improve surface finish, and make minor tooth-form corrections by being rotated in mesh with hardened gears in crossed-axes relationship.

A comprehensive display of other types of broaches for gears, involute splines, round holes, special shapes, and external forms will accompany examples of typical broached parts. Booth 814.

Circle **678** on cards facing back cover

Red Ring full-form finishing broaches for internal spur and helical gears and splines



DeVlieg to Display "Microbore" and "Microface" Adjustable Tooling

A complete line of products of DeVlieg Microbore Division, DeVlieg Machine Co., Royal Oak, Mich., will be on display, including "Microface" adjustable-blade facing heads for boring machines, turret lathes, and heavy drilling equipment. These adjustable heads face or spot-face wide surfaces from 1 1/2 to 8 1/2 inches in diameter without special tooling. The blades are replaceable with a minimum of down time without removing the head from the machine.

Another feature of the DeVlieg display will be titanium-carbide and ceramic-tipped "Microbore" adjustable tooling that cuts at speeds and feeds said to be impossible with other type tips, yet produces outstanding surface finishes. Like all Microbore tools, they are cone-relief ground to gage-room accuracy.

Accuracy with economy are the features claimed for Microbore adjustable tooling with Kendex throw-away inserts which will also be on display. Cutting is done by Kendex mechanically held inserts which are thrown away after all cutting edges have been used. Fast indexing or removal is accomplished through the Kendex system of mechanical clamping. Replacements are said to be far more economical than regrinding.

"Pre-set" tooling and double adjustment for the Microbore system will be demonstrated. The Pre-set system provides for pre-setting microbore tools or boring-bars to accurate part dimensions outside the machine. "Double adjustment" provides both axial and radial micrometer vernier adjustment of cutting tools.

Circle **676** on cards facing back cover

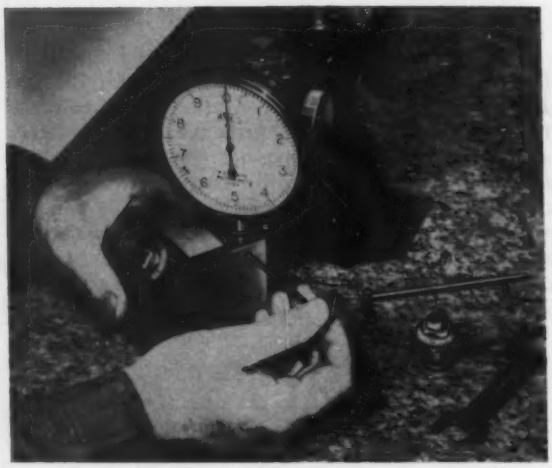


Fig. 1. DeVlieg tool-resetting equipment

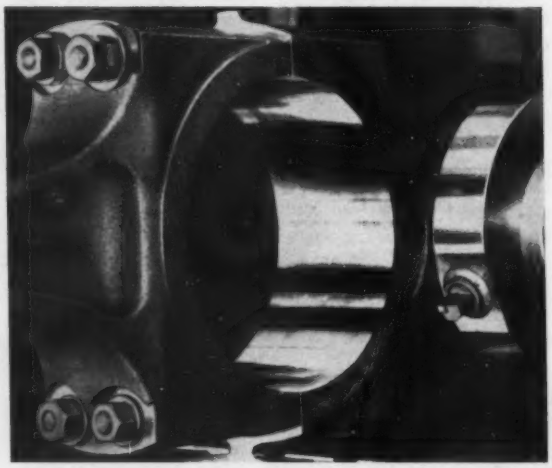


Fig. 2. DeVlieg titanium-tipped tool

Engis to Display Measuring and Inspection Equipment

Precision instruments for research, analytical and production inspection of parts for roundness, surface finish, straightness, squareness, parallelism, and alignment will be displayed by the Engis Equipment Co., Chicago, Ill. One of the instruments to be shown is the Watts 90-degree "Clinometer." This instrument is available in modified form for special leveling and tilt testing requirements. The control bubble level has a sensitivity of 20 seconds and is mounted on a separate platform at the top of the instrument.

The Clinometer can be used to precisely set up, adjust, and control platforms, tilt-tables, or indexing and level devices over a 90-degree range. The micrometer knob shows graduations in red and black for clockwise and counterclockwise direct angle readings.

Part of the Engis exhibit will be devoted to educational displays on precise metrology, specializing in the field of analytical metrology and universal optical tooling. Booth 926.

Circle **625** on cards facing back cover

Watts Clinometer to be shown by Engis Equipment Co.

PRODUCTS

Scully-Jones Ball Screws, Tools, and Chucks

Scully-Jones & Co., Chicago, Ill., will show recirculating and anti-friction "Tychoway" bearings and "Super-Cision" ball screws, Fig. 1, for supporting and positioning machine components moving in a straight line. Used together, they claim to make linear motions completely predictable, accurate, and repeatable. Other equipment on display will be automatic recessing tools with a simplified adjusting collar and interchangeable stop collars and pilot nose assemblies; "Better-Hold" chucks, featuring a simple lock-and-eject nut which draws a tapered liner into compression in a mating internal taper in the chuck; "Stub-A-Long" chucks which permit accurate drilling without guide bushings; the "Toolitrol" system for presetting, storing, and changing tools; and hydraulic expanding mandrels which hold parts and tools during turning, grinding, and inspection operations.

Also to be shown are self-opening stud setters, Fig. 2, having interchangeable shanks which quickly adapt them for air or electric power tools, drill presses, radial drills, and similar machines; and a "Safe-Torque" clutch, Fig. 3, which incorporates an over-running roller drive releasing instantly when resistance to the driving torque reaches a preset limit. Booth 1127.

Circle **671** on cards facing back cover

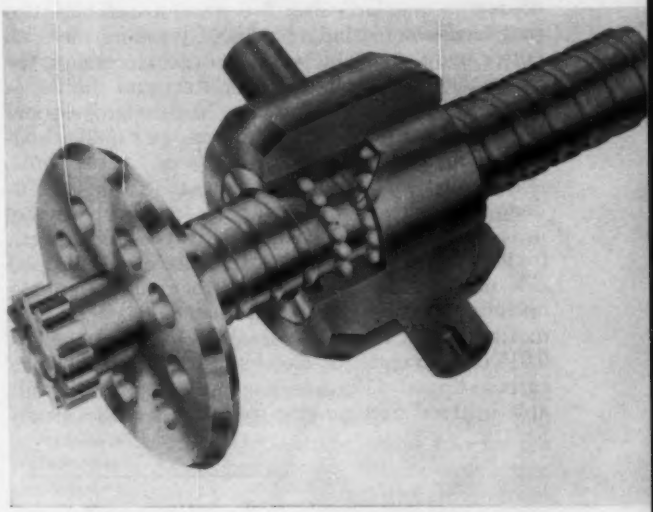
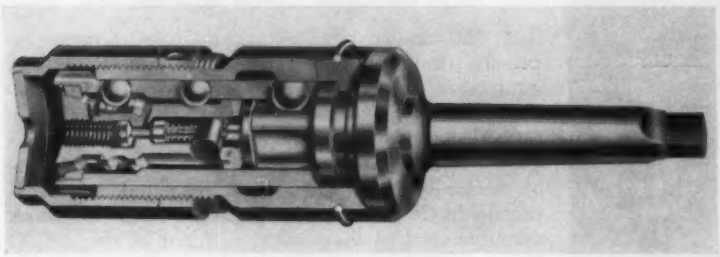


Fig. 1. Recirculating ball screw, single-nut design

Fig. 2. Stud setter with interchangeable shanks



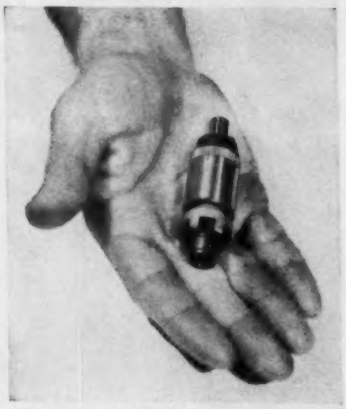


Fig. 3. Overload clutch for portable air-driven screwdrivers

Boring Tools and Thread-Measuring Sets

The Flynn Mfg. Co., Detroit, Mich., will display its line of offset boring heads, boring bars, boring tools, and thread-measuring sets. The main feature of the exhibit will be the recently introduced Series "60" round-contour offset boring head. This boring head has a long and stockier tool-block designed for secure holding of the horizontal tool and the strength required to take heavy cuts.

The horizontal hole is broached for holding both round and square tools. Two vertical-mounting holes are made possible by the longer tool-block. One hole is centered in the block and the second hole is offset, increasing the amount of over-all offset available.

Introduced with the 60 series boring head is a vernier on the body which facilitates adjustment of the micrometer offset screw, making possible extremely close visual offset adjustment. This feature is also included in Flynn 30 and 40 series heads.

Circle **629** on cards facing back cover

Carbide-Tipped Angular Cutters

The Cutting Tool Division of Brown & Sharpe Mfg. Co. Providence, R. I., will exhibit a new Nelco carbide-tipped angular cutter now available from stock for milling angular grooves and dovetails. This 45-degree angular cutter has generous carbide tips that facilitate regrinding without grinding the steel cutter body. Available with two carbide grades, the Series 200 is recommended for steel and the Series 300 is recommended for milling angular grooves and dovetails in cast iron, brass, bronze, and similar nonferrous materials.

Designed for use on an arbor, the teeth have 0-degree rake. The cutter may be ordered with keyway in line with teeth or located halfway between teeth for interlocking or ganging with Nelco carbide-tipped side mills, slab mills, and saws for multiple milling operations. Chamfer on outer diameter is 1/64 inch maximum and tolerances are held to plus or minus 0.015 inch on cutter diameter and width. These Nelco carbide-tipped 45-degree angular cutters are available in three sizes ranging from 4 to 6 inches in diameter and in either left- or right-hand styles. The 4-inch-size cutters have ten teeth.

Circle **680** on cards facing back cover

Nelco carbide-tipped cutters

Electric hydraulic press built by ACCO Equipment Division, American Chain & Cable Co., Inc.

Heavy-Duty Press and Hardness-Testing Equipment to Be Exhibited by American Chain & Cable Co.

A 150-ton-capacity electric hydraulic press expressly designed for heavy-duty operations and equipment, featuring the latest techniques in hardness testing, will be exhibited by the American Chain & Cable Co., Inc., Bridgeport, Conn. The 25-ton press shown in the illustration is part of the complete line of manually-operated, air-operated, and motorized presses in the line of 25- to 150-ton range machines manufactured at the York, Pa., plant of the ACCO Equipment Division of the American Chain & Cable Co., Inc., which will be exhibited at the show. The 150-ton motorized hydraulic press has the ability to handle tough press applications where pressures of up to 150 tons are required. Stamina, to absorb rough treatment in continuous duty-cycle, is an outstanding feature claimed for this versatile and economical production tool.

Practical techniques, featuring the latest advances in the science of hardness testing for quality control and the determination of the hardness of materials, metals, and their alloys, will also be demonstrated at the show by the Wilson Mechanical Instrument Division, American Chain & Cable Co. This demonstration will cover the application of an extensive line of Rockwell, Rockwell superficial, and Tukon microhardness testers for research laboratory and mass-production work. The completely new and highly efficient Model LL microhardness tester will be included in the demonstration. This economical and

PRODUCTS

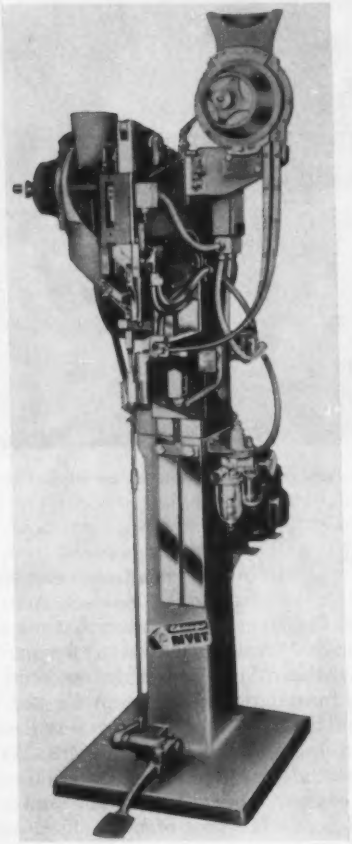
semi-automatic Model LL tester, with its relatively selective range of indentation loads of 25 to 1000 grams, is especially designed for quick, reliable checking of work specimens.

Also to be shown for the first time will be a compact Rockwell hardness tester which has been designed for use in the testing of large components and work specimens that are too heavy for economical hauling to a testing station. Utilizing C-clamp brackets with varying throat sizes, this instrument can be easily moved from one location to another in open yards, production areas, and construction sites. The brackets are manufactured from lightweight alloy steels to give a rigid clamping effect. Standard Rockwell B and Rockwell C scale tests are produced by spring loading, using springs that are naturally and artificially aged.

Other equipment to be exhibited includes: versatile "TwinTester," a combination unit which is capable of making readings in both the Rockwell and Rockwell superficial ranges; Size 3 fully automatic feed-and-discharge type Rockwell tester, a unit for mass-production hardness evaluation of up to 1000 tests per hour; motorized and semi-automatic Model Y tester; several hand-operated Rockwell testers; Rockwell superficial tester; and the Tukon microhardness tester, as well as a wide variety of accessories. Booth 715.

Circle **668** on cards facing back cover

Automatic Riveting Machine



Riveting machine to be shown by Chicago Rivet & Machine Co.

An automatic riveting machine will be introduced at the show by the Chicago Rivet & Machine Co., Bellwood, Ill. This unit simultaneously positions and passes a tubular rivet through an assembly and into a washer which serves as a strong metal area for the rolled clinch. An adaptation of a cutlery rivet setter, this machine makes possible the fast and secure riveting of light metals and any other material requiring the added protection of a washer. Booth 1845.

Circle **635** on cards facing back cover

Houghton to Introduce "Cerfa-Kleen" Production-Line Cleaners

"Cerfa-Kleen," a new series of production-line cleaners, will be displayed for the first time by E. F. Houghton & Co., Philadelphia, Pa., developer of this product. The four compounds in this line are said to be "tailored" to the exact requirements of four basic industrial metal-cleaning processes employing hot and cold power washers and soak tanks.

Aside from Cerfa-Kleen, Houghton will demonstrate the operating efficiency of the following products:

(1) Hocut 237—a popular, water-soluble, nonpetroleum machining coolant that extends tool life and prevents rust.

(2) "Liquid Heat" salt baths—five Houghton salts developed for the heat-treatment of high-speed steels.

(3) Packings, "O" rings, rod wipers—Houghton's comprehensive line of homogeneous, fabricated, and leather impregnated packings, homogeneous "O" rings and bronze Seal-Guard wiper rings.

(4) Precision molded parts—close-tolerance products of synthetic rubber in an unlimited range of forms and sizes.

(5) Rust Veto—easy-to-use, long lasting rust preventives—including Rust Veto spray—for interior and exterior use. Booth 135.

Circle **628** on cards facing back cover

LATEST DEVELOPMENTS

Machine tools, unit mechanisms, machine parts, and

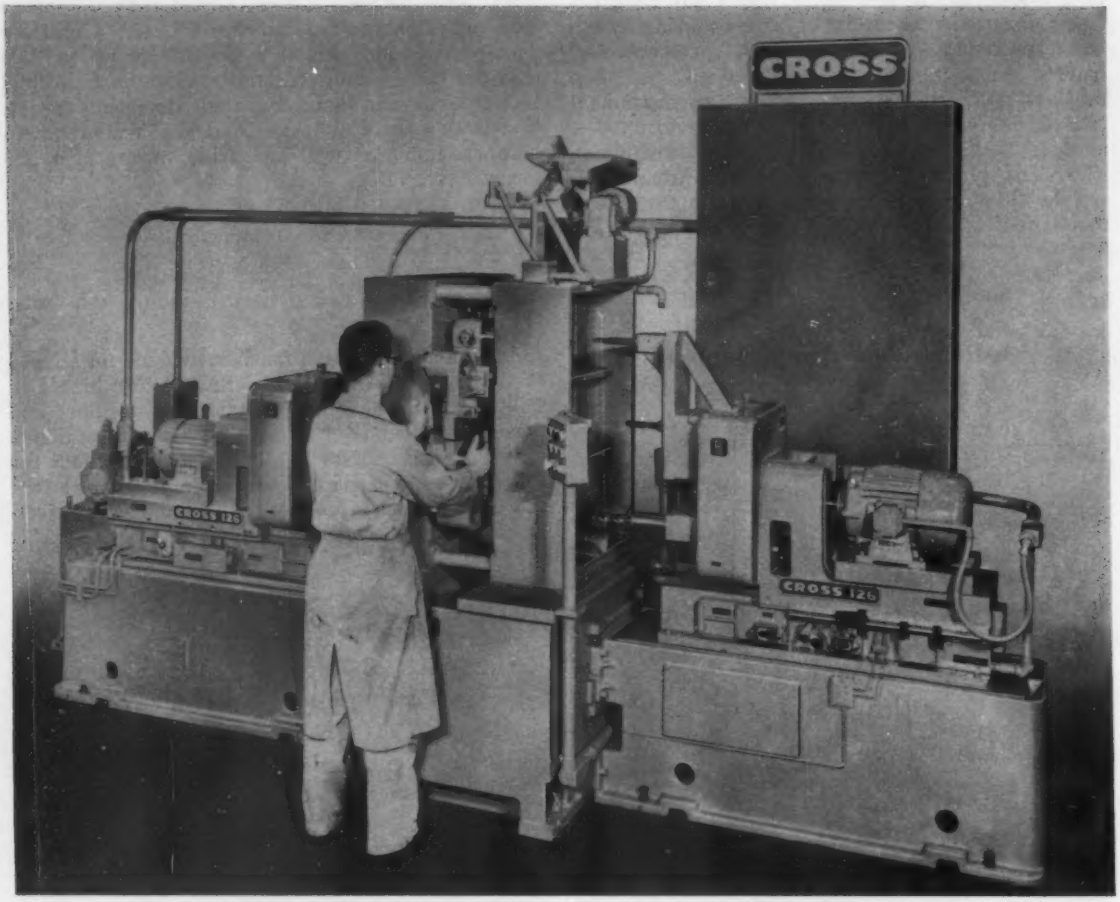


Fig. 1. Four-station Cross trunnion machine that produces seventeen different parts and features an assembly operation

Cross Automatic Trunnion Machine Designed to Process Seventeen Different Parts

Seventeen different slack-adjuster arms can be processed by a single automatic trunnion machine designed and built by The Cross Co., Detroit, Mich., for a large manufacturer of air brakes. Although production of any one of the adjuster arms would not justify the development of a special automatic machine, their combined production volume makes the building of such equipment profitable. The trunnion machine, Fig. 1, has four stations. It accurately drills, chamfers, and reams the parts, and inserts bushings in from one to three holes in each of the slack adjusters. The key to the flexibility of this machine is the use of tooling that can be easily adjusted to handle the different work-pieces, typical examples of which are shown in Fig. 2.

Over a period of hard usage, the cable employed to operate air brakes on heavy semitrailers gradually develops slack. Adjuster arms are provided so that the cable link can be moved to take out the slack. Such slack adjusters could be mass-produced except for the fact that different trailer installations call for different designs. As can be seen in Fig. 2, these differences are quite numerous and include: amount of tang offset, number of holes, location of holes, distance of holes from the large central opening, size of the central open-

IN SHOP EQUIPMENT

material-handling appliances recently introduced

Edited by FREEMAN C. DUSTON

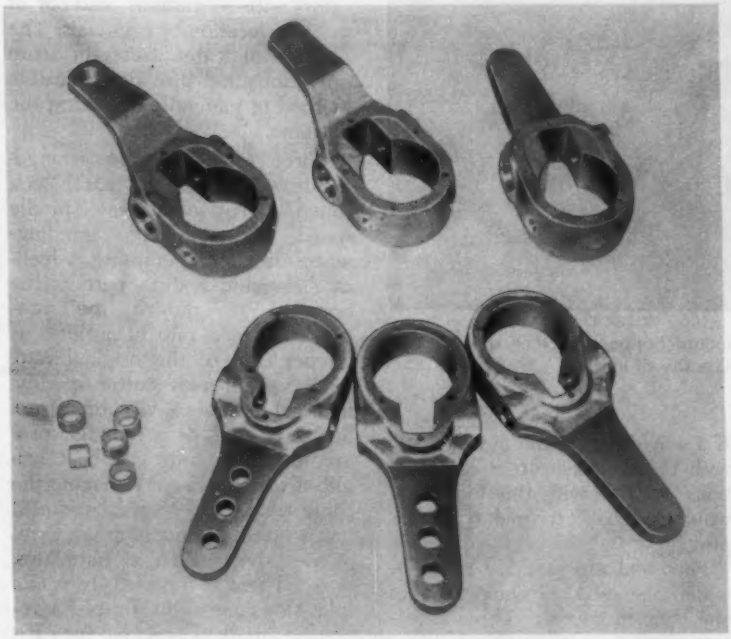


Fig. 2. Typical work-pieces produced on Cross machine shown in Fig. 1

ing, and size of the adjustment holes.

Of the seventeen styles now made on the single trunnion machine, five have only one hole, eleven have two holes, and one has three holes. They also vary as to position and combinations. There are seven different combinations of offset and eccentricity represented among the parts. One slack adjuster has two holes but only one of these requires a bushing. All work-piece variations have been taken care of in the tooling design and it is probable that if other styles are required in the future, these also can be produced on the same machine.

The trunnion of the machine is square. Parts are unloaded and loaded, during the machining cycle, at the front of the machine. Drilling and chamfering are accomplished in the lower station, reaming and chamfering are done in the back, and bushings are inserted in the upper station. Regardless of the style of adjuster being produced, 150 can be made each hour when the machine is operated at 100 per cent efficiency. The accuracy of this machine is assured by the precise location of the trunnion at each indexed position. The location method is unusual and, though simple, is said to be more accurate than the normal shot-pin arrangement. Also, with this method, the cycle-control switch is so located that immersion by the cutting fluid is impossible.

Trunnion location is achieved by a stop-pin with a cutout that matches the diameter of four cylindrical index stops. The stop-pin has a central air passage and is cammed outward as it passes over an index stop. It is returned to its normal position by a self-contained spring. Outward and return motions of the stop-pin control the motion of a limit switch and, through it, the machine cycle. As the stop-pin rides up and over an index stop, the drive-motor is reversed. This causes the trunnion to rotate backward slightly until the index stop nests in the stop-pin cutout. When the pin and stop meet, the air passage in the pin is closed. Back pressure thus caused in the air line operates an air cylinder to initiate the "cycle-start" switch.

Because a normal splash-lubrication system would produce unwanted heat in the heads, a method of generating a fog within each head was developed. With this self-contained system, little fog escapes to the atmosphere. Simple labyrinth seals at the spindles exclude coolant.

In the unusual assembly operation on this trunnion machine, bushings are fed from a vibrating hopper into three vertical tracks that position them in front of push-rods (Fig. 3) in the top station. The bushings are oriented in the hopper by a blade. If the adjuster being made has only one hole, only one push-rod is affixed to the head. Nothing has to be done to the bushing feed mechanism because bushings will not feed into full tracks. Since two different-size bushings are used, the hopper and the tracks must be emptied when making a change. On the insertion stroke, push-rods pick up a bushing, position it, seat it, and size it. When changing the bushing size, the tracks are emptied—by removing the four thumbscrews holding the bottom guard—and the hopper is emptied.

Most important in the tooling are four adjustable work-holding fixtures. Work-pieces are slipped over horizontal plugs, in the fixtures, that accurately locate the

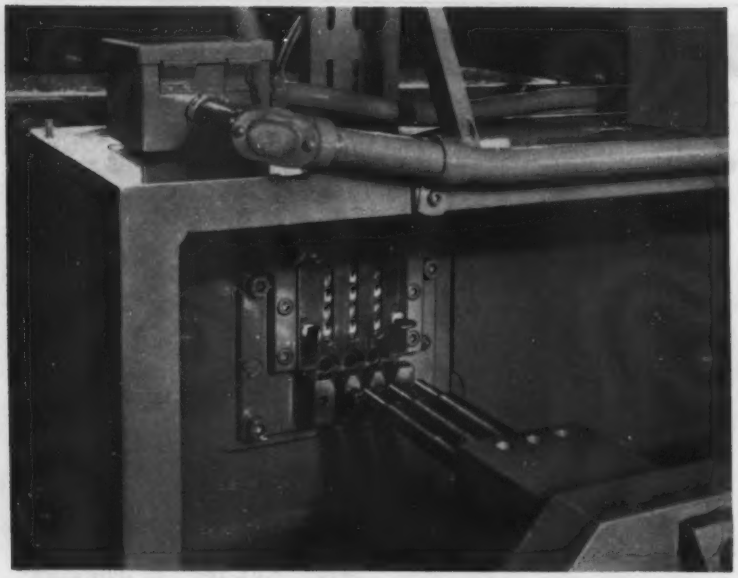


Fig. 3. Bushings are oriented in a standard hopper and then delivered to three tracks on machine shown in Fig. 1

large opening in the arm. Two plug sizes are used in several positions to cover the current family of parts. Plugs are moved laterally and keyed to provide a firm foundation for the body of the arm so that tangs can always be clamped in the same plane, regardless of offset.

In use, the operator slips a work-piece over the plug and seats the tang against a stationary—but adjustable—stop. After one-half turn of an actuating handle, the quick-acting wedge-clamp is: (1) rotated to the clamped position, (2) rapidly pulled in to the part, and (3) clamped securely.

For the seventeen parts now being produced, seven combinations of plug sizes and location are used. If a new design could not be made with these or five other combinations possible with this tooling, it would be easy to make another plug.

Few tool changes are required when changing production from one style to another. Three different diameters of subland high-speed steel drills—including chamfer cutter and chip-breaker tip—cover the range of hole sizes. Two subland high-speed steel reamers —including chamfer cutter and one core drill (used as a chamfer cutter)—complete the cutting tools. Two sizes of piloted push-rods are used to insert the different sizes of bushings in the work-pieces.

Circle **561** on cards facing back cover

Bendix Numerical-Control System for Precision Contouring Machines

A Bendix two-axis numerical-control system that controls precision turning, boring, and grinding operations on contouring machine tools in increments of 0.000025 inch is now available from the Industrial Controls Section, Bendix Aviation Corporation, Detroit, Mich. This system provides a command pulse value to each machine slide of 0.000025 inch or 40,000 pulses per inch of slide travel. Machining to a tolerance of 0.0001 inch is thus possible in routine production of templates and to a tolerance of 0.0002 inch in contour-boring and turning operations on precision machine tools.

The input to the control unit is punched tape. The high-speed tape reader on the numerical machine-control unit permits tape reading of 300 lines per second in the forward direction and 600 lines per second in the reverse direction. An automatic feature eliminates the need for manually rewinding the tape at the end of a part-machining operation and allows the operator to remove the part as the tape is being rewound. There are two decimal-display position indicators with continuous read-out of position location of each axis. The position indicator assists in setup operations and provides a flexible method of manually operating the machine.

Three auxiliary tape arrangements automatically control such functions as coolant flow, spindle speed, and automatic grinding-wheel dressing operations. A feed-rate override feature permits the operator to reduce the programmed feed rate to as little as 20 per cent of the original rate. Such variables as cutter quality, material hardness, vibration from fixture or tool, or a too-high programmed feed rate can be taken into account without remaking the control tape to provide reduced tool loading in critical areas. Symmetrical parts, such as templates, may be simply and easily made from the same control tape. A reversing circuit is provided for each axis which will effectively complement or reverse the direction of machine motion from that specified on the tape.

A control tape which contains in binary coded form all information necessary to machine a specific part is first mounted on the tape reader of the Bendix two-axis machine-control unit. The operator then positions the cutter manually to the setup point corresponding to the initial position on the tape and depresses the tape "start" button. Automatic machine operations then begin.

The first block of information on the tape is read by a photoelectric tape reader and held in temporary storage. At the same time, each line is simultaneously checked to insure that the tape is punched and read correctly. This error-detection circuitry prevents reading erroneous information into the interpolator. An interpolator then accepts the block information from temporary storage and generates

continuous trains of command pulses for both the longitudinal and transverse axes of motion. The number of pulses generated for each axis is proportional to the distance to be moved along that axis. The rate at which these pulses are generated is proportional to the programmed cutter-feed rate. Feedback devices, called quantizers, are attached to both the longitudinal and transverse axes. These devices accurately measure the actual movement of these axes and produce feedback pulses, each of which is equal to the same increment of travel as a command pulse.

Error registers (one for each machine axis) then receive command pulses from the interpolator and feedback pulses from the quantizer. These signals are then compared, and their accumulated difference, known as the error signal, is transmitted to a servo amplifier. This error signal is then converted by the servo amplifier into analog form and amplified. Following this, the amplified signal actuates a torque motor which operates a proportional-control servo valve. The valve controls the flow of oil to a hydraulic rotary motor which drives the longitudinal and transverse slides of the precision turning and boring machine. The control signal actually delivered to the servo drives is proportional to the instantaneous difference or error between the total number of command pulses and feedback pulses received by the error register.

While any motion is being executed, the photoelectric reader reads the next block, thus loading temporary storage with the next straight-line increment of motion. When the interpolator completes the processing of a block of data, it is instantaneously reloaded from temporary storage and interpolation continues uninterrupted. Tool motion is, therefore, continuous.

Circle **580** on cards facing back cover

Bendix numerical machine-control unit for controlling precision contouring machine tools

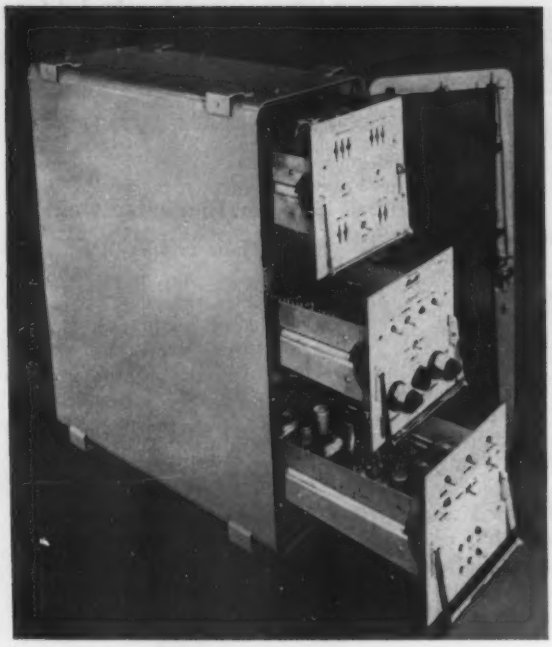
Mauser Electrical Gages

The Scherr-Tumico Co., New York City, has announced the addition of Mauser electrical gages to its line of gaging equipment. Fast, effortless inspection to present-day tolerances and the employment of automatic devices guided by the gaging results are said to be facilitated by the use of this equipment. Electricity is successfully used by the gages in transforming ordinary mechanical comparator gages into units that indicate the passing of tolerances by flashing lights. Electric limit contacts built into the gaging unit are designed to act with a finer discrimination than ordinary dial indicators. They enable off-size conditions to be accurately and instantly detected within 20 millionths of an inch.

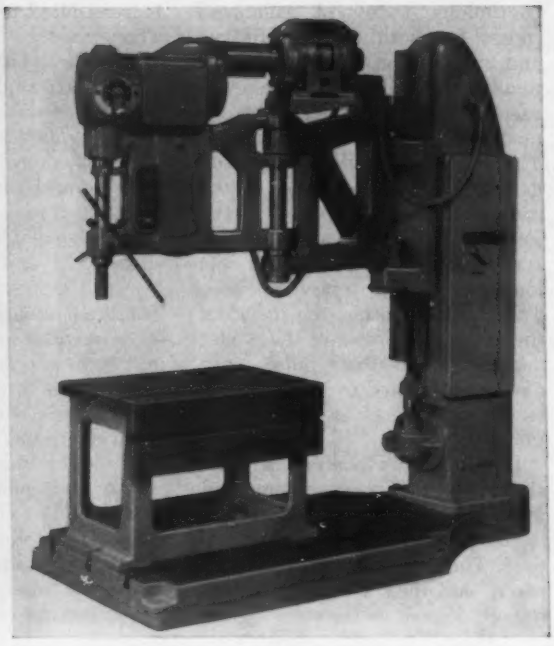
Electrical gages introduced by Scherr-Tumico Co.

In addition to its high degree of accuracy, the electric comparator gage is said to be faster than the usual mechanical indicating gage. Signal lights accurately report oversize as well as undersize and correct-size work by the flashing of a green, red, or yellow light. Other important advantages claimed for electrical gaging are the low initial cost and the elimination of installation expenses as well as high maintenance costs.

Circle **565** on cards facing back cover



Monautronic V-2 Feedback Spotwelding Control



Footburt-Hammond radial drilling machine

Electronic Control for Spot-Welding

An electronic spot-welding control that utilizes digital and analog computer elements, known as the "Monautronic V-2 Feedback Spotwelding Control," is now being manufactured for the welding industry on a production basis by the Budd Co., Philadelphia, Pa. Employing the feedback principle of automatic control, this unit is said to produce quality welds regardless of the actual in-process variables. The illustration shows the Budd Monautronic control using rack-panel construction, with individual sequencing, heat, and power modules guided by rails into a carrier, which is in turn shock-mounted within an external cabinet.

Circle 563 on card at back of book

Sensitive Radial Drilling Machine

A Type G Footburt-Hammond sensitive radial drilling machine incorporating a completely new electrical system and embodying a number of improvements over earlier models has been announced by the Foote-Burt Co., Cleveland, Ohio. The push-button station of this unit is located at the drill head and the main electrical enclosure is set into the machine column. A jointed arm permits ready placement of the head in relation to the work. Thus the time required to move from one hole position to another is reduced to a minimum. The machine is designed for drilling, tapping, reaming, and similar operations on any large work requiring a number of holes spread over a large area. It is especially adapted for machine repair and tool-and-die work.

The saddle which carries the hinged arms is mounted on the column with an adjustable gib. Vertical travel is provided by a screw and optional motor drive. The hinged arms swing upon stationary trunnions on the saddle, with the weight carried on ball thrust bearings. Adjustment is provided to compensate for wear in the hinged joints.

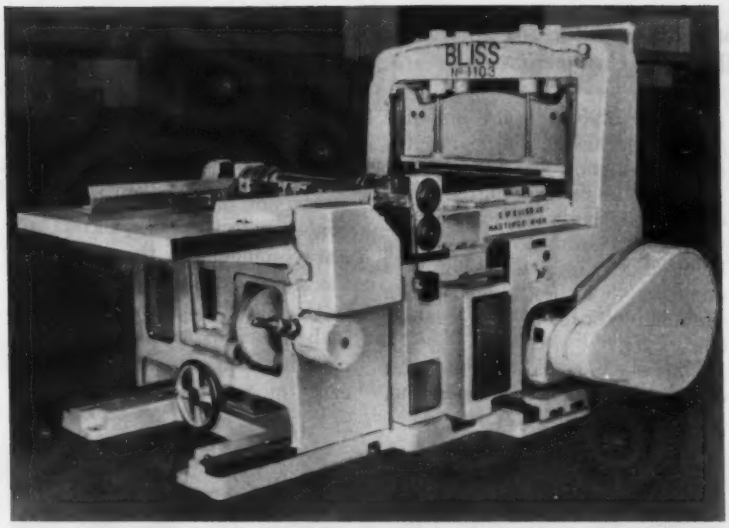
The fully counterweighted spindle is provided with hand feed and six-speed drive. Vertical adjustment of the saddle is 24 inches and spindle travel, 7 inches. The spindle can be moved in a radius from 15 to 50 inches from the saddle trunnions. On a 60-cycle installation the machine has spindle speeds of from 95 to 1140 rpm; it will drill 1 1/8-inch holes and tap 1-inch holes in cast iron, and drill 1-inch holes and tap 7/8-inch holes in steel. Both speed and capacity are reduced slightly by 50- or 25-cycle installations. The machine is also available arranged for post or wall mounting.

Circle 564 on card at back of book

High-Speed Scroll Shear

The Container Machinery Division of E. W. Bliss Co., Canton, Ohio, has developed a scroll shear for the high-speed automatic production of scrolled strips used in the manufacture of can ends, screw caps, and similar closures. Improvements over the older models to be found in the Bliss No. 1103 automatic scroll shear include elimination of the idle stroke between sheets—every stroke is a cutting stroke—materially increasing the production of scrolled strips.

Capable of shearing sheets up to 36 inches square, the new scroll shear is fitted with trimming cutters that can be ground in place by means of a standard slitter-cutter



Bliss high-speed automatic scroll shear

grinder. Access to the cutters is provided by mounting the first table on gibbed ways so that it can be slid back from the second table. Cam-actuated side gages on the first table adapt the scroll shear to either lithographed or plain sheets, while magnetic feed-bars and hardened back gages insure precise registry of the sheet for each cut.

All strips produced can be automatically discharged to the top stacking bin, while scrap from the first cut is collected in the second bin. A third bin can be provided to collect the last strip, which has one straight edge, when it is desired to separate it from the full scrolled strips.

Circle 656 on card at back of book

tional phases. Each phase unit may be purchased individually. The read-out gage visually indicates at all times the exact location of a machine tool element. Numerals on the gage are preceded by a plus or minus sign to indicate movement of a machine element to either side of the zero reference point. This zero offset feature makes it possible to establish zero read-out at any predetermined reference point on the work-piece. Hole-to-hole and surface-to-surface reading dimensions set on the center line of the machine spindle agree exactly with engineering drawings.

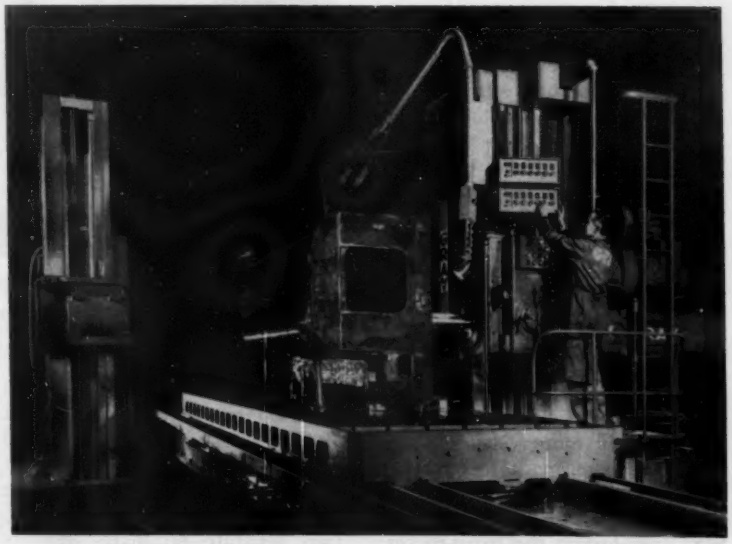
The display gage reads to three decimal points for each axis, and registers over-all accuracies to 0.001 inch. With this system, there is no accumulated error such as might occur when a lead-screw is used. It is unaffected by line voltage variations, is jam-free, and has no thermal drift. Operation is possible at unusually high speeds, with traverse rates up to 360 ipm. Multiple read-out gages are offered, and smaller read-outs may be accommodated. The Gray Space Setter is available for any number of axes on Gray horizontal milling and boring machines, and on planer type milling machines.

Circle 572 on card at back of book

Norden Numerical-Control System Developed for Gray Planers

The G. A. Gray Co., Cincinnati, Ohio, has announced the development of a numerical-control system expressly for machine tool application. The device for applying this system, called the Gray "Space Setter," was jointly developed by the G. A. Gray Co. and Norden Data Systems, a division of United Aircraft Corporation. It utilizes rugged, modular construction, with heavy-duty printed circuits. Replaceable components are designed to facilitate servicing and minimize maintenance problems.

One of the unique characteristics of the new system is that it offers progressive steps to full tape control. A more elaborate system or phase may be implemented by the simple addition of elements, building-block fashion. The dialing of desired coordinates, and tape-controlled, preplanned programming can be accomplished in addi-



Space Setter numerical-control system applied to this G. A. Gray horizontal boring mill permits working to closer tolerances., lessens the possibility of costly errors, and minimizes nonproductive time

Bullard Precision Contour Grinder for Processing Missile Nose Cones

Precise linear and nonlinear contours of missile nose cones and other convex surfaces can be accurately produced by a single-head grinder with tracer control and automatic swiveling which has recently been developed by the Bullard Co., Bridgeport, Conn. The first machine of this new design, Fig. 1, which has a 66-inch table and a maximum work height of 8 feet, has just been delivered to Avco Corporation's Lycoming Division, Stratford, Conn. Other machines of this design will be developed in different sizes to meet the requirements of individual customers.

Completion of this machine in a total of ten months—from original conception to delivery—was made possible through the use of standard components from comparable-sized Bullard vertical turret lathes and vertical boring mills.

Primarily, the single-head machine, Fig. 1, was designed to carry out precision line-contact external surface grinding in which the straight face of the grinding wheel is kept parallel to the surface of the work at all times. This may be described as a process in which the plane of the grinding wheel is kept always perpendicular to the tangent of the contour of the surface being ground. It is claimed that this line-contact grinding is faster and also produces a smoother surface than conventional point-contact grinding performed with a round-faced wheel. It is also said that with line-contact grinding there is less wheel wear in proportion to the amount of material removed from the work and that the wheel does not require as frequent dressing.

By the use of special extended spindles, the machine can also be used for internal grinding, but only to produce a straight surface, not a contoured one. To make the machine still more versatile, provision has been made for carrying out precision machining operations. The entire grinding unit, Fig. 2, including the drive-motor, can easily be removed from its mounting plate, and cutting tools can then be secured to this plate, as shown in Fig. 3, for precision contour-machining employing the same tracer control and automotive swiveling as in grinding. A separate tool-holder has also been devised which permits the machine to be used for internal boring to a depth of 48 inches, either with a straight, vertical cut or a contour cut.

The machine is designed for completely automatic operation, incorporating a standard General Electric two-dimensional tracer control plus a specially designed automatic swiveling control. A single template is used to guide the movements of the grinding head. Two separate template-followers with a common axis ride the edge of this template. One controls the horizontal and vertical feed; the other controls the automatic swiveling mechanism. The movement of the template-followers can be in either direction along the template —either clockwise or counter-clockwise. The result of this combination of controls is to keep the surface of the grinding wheel in contact with the work, and its face always tangent to the coutour of the surface of the work.

The template, for work over 48 inches and up to 96 inches high, can be dropped vertically before each succeeding "pass" to allow for changes in the curvature of the work as grinding progresses. The axis of the two styluses which follow the template can be moved horizontally (toward the work) by as much as 2 inches to adjust for grinding-wheel wear and reduction in the diameter of the work. On work up to 48 inches high, the template can be easily moved hor-

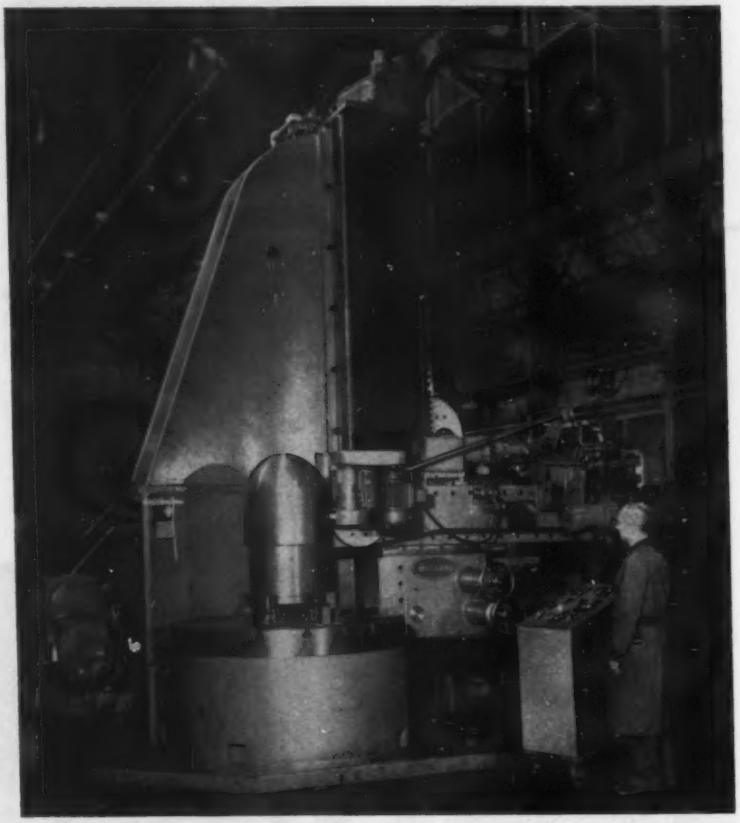


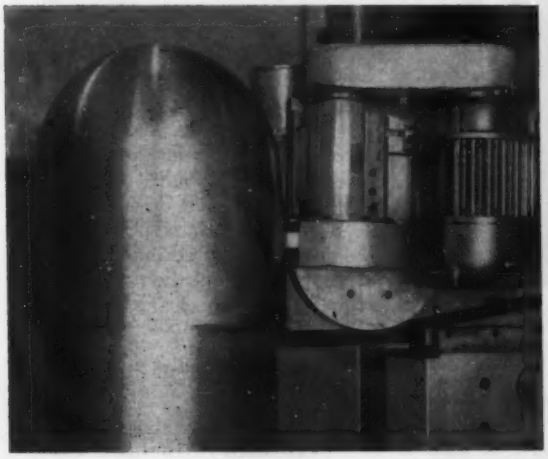
Fig. 1. Over-all view of Bullard swiveling single-head grinder with operator control console

izontally and vertically to allow for dimension changes.

Table drive is direct and positive, with power supplied by an externally mounted 20-hp, variable-speed drive. A series of V-belts permits the table speed to be infinitely varied throughout the range from 20 to 100 rpm. Both horizontal and vertical feed of the head are power-actuated, through the tracer-control system. The design provides for a maximum, constant feed rate of 1 inch per minute. Handwheels permit initial setup to be carried out manually.

The grinding head is mounted on a plate at the inner end of the cross-slide. A separate 10-hp two-speed drive-motor for the grinding-wheel spindle provides a choice of two spindle speeds: either 1800 or 3600 rpm. The precision spindle is designed to handle wheels up to 13 inches in diameter. The head can be leveled to an accuracy of 0.0002 inch per foot of length by using a precision level in conjunction with accurate adjustments. The grinding wheel can be dressed in place by mounting the dressing cutter on the work-table and using the side-head feed to advance the wheel. The machine has automatic forced lubrication of all bearing surfaces of the ways, rail, saddle, slides, feed screws, nuts, and other external moving parts from a single oil reservoir. A Delpark coolant filter system is provided. The total weight of the machine, exclusive of the external electronic control system and the operator's console, is 80,000 pounds.

Circle **579** on cards facing back cover



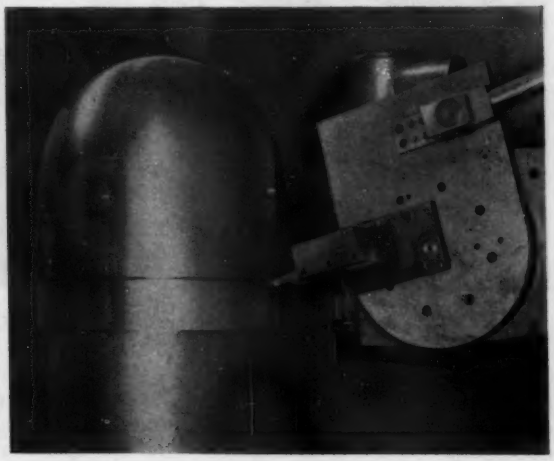


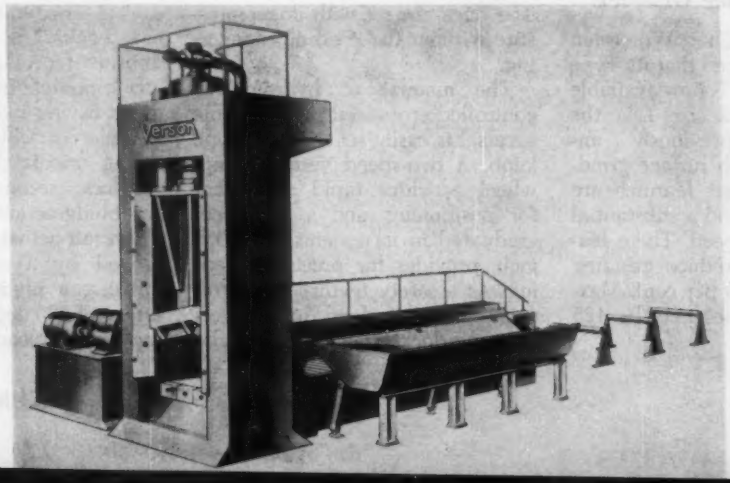
Fig. 2. (Left) Close-up view of line-contact grinding-wheel unit of machine shown in Fig. 1.

Fig. 3. (Right) Close-up view of mounting plate with grinding-wheel unit, Fig. 1, removed and tool-holder mounted for precision machining

Large-Capacity Scrap Shear with Conveyor Feed

A conveyor-fed hydraulic scrap shear of a revolutionary design is being built by the Verson Allsteel Press Co., Chicago, Ill. This machine is designed to specifications of the M. S. Kaplan Co., Chicago. The new shear has extra-large capacity because of the open-end construction of the charging box. Steel-mill rejects or bulky railroad and heavy industrial scrap of any length can be handled without

Scrap shear built by Verson Allsteel Press Co. for the M. S. Kaplan Co.



Surface grinder announced by the Norton Co.

prior cutting with torches. The continuous conveyor system permits operation without interruption —cutting to lengths in multiples of 6 inches to 5 feet or more.

A smaller shear, embodying the same type of construction, but of approximately 400-ton capacity, is now being designed for use in small scrap yards. M. S. Kaplan Co. is exclusive distributor of the new equipment and is making it available for purchase, lease, or toll operation by Kaplan personnel.

Circle 570 on card at back of book

Norton Surface Grinder

The Norton Co., Worcester, Mass., has announced that its Type S-3 surface grinder is now available in the 8- by 24-inch size. Like the 6-inch model previously announced, the 8-inch surface grinder's most significant features are ease of operation and a substantial increase in table speed. These features are said to reduce grinding time as much as 50 per cent. Maximum table-traverse speed is 125 fpm.

In addition to reducing grinding time, the high maximum table-traverse speed is said to help reduce burning, checking, and cracking of the work. This advantage is particularly significant when heat-sensitive steels are being ground.

Another significant feature is the machine's capacity for grinding a work-piece as high as 13 3/4 inches under a standard 10-inch-diameter grinding wheel. Long, vertical ways provide rigid support even at the maximum 13 3/4-inch height. A centered reversing lever aids in simplifying work setup, permitting the operator to line up the table dogs with the ends of the work. The dogs are set with finger pressure without the need of hammering.

The amount of hydraulically controlled cross-feed at each table reversal is easily set by a dial type knob. A two-speed vertical handwheel provides rapid movement for positioning, and a fine feed, graduated in increments of 0.0001 inch, provides for precision feeding. As a safety feature, table-traverse and cross-feed handwheels are interlocked with hydraulic start-stop lever to prevent rotation of the handwheels during hydraulic-powered motion. Automatic lubrication of the sliding table and saddle ways is provided as standard.

Continuous cross-feed without reciprocation of the table, facilitates truing and setting up. Cross-feed stop dogs automatically stop the table movement, with the wheel off the work, when table cross-feed reaches a preset limit. This enables an operator to set up another machine while the surface grinder is operating. The wheel is driven by a 2-hp motor, while the hydraulic system is driven by a 1-hp motor.

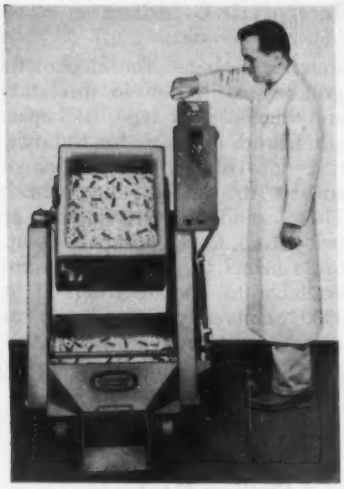
Optional equipment available with this machine includes a vertical power positioning unit, magnetic or electric chucks with all controls, dust-collection unit, integral motor spindle, wheel-guard truing, automatic down feed, and JIC electrical standards. The machine can be arranged for wet grinding, application of coolant through the wheel, and electrolytic-assist grinding.

Circle 574 on card at back of book

Vibratory Machine for Finishing Metal Parts

A low-cost vibratory type finishing machine has been announced by Almco, Queen Products Division, King-Seeley Corporation, Albert Lea, Minn. This Model VT-72 Vibrasheen unit has been designed to offer all the advantage of vibratory finishing of metal parts such as deburring, descaling, cleaning, burnishing, and surface refinement. It is said to handle this class of work at greatly reduced time cycles as compared to ordinary barrel finishing. The unit has a capacity of 2 1/2 cubic feet and a standard vibrating frequency of 3380 cycles per minute. In many instances, parts having internal burrs can be completely deburred, since the finishing media enters holes and crevices, setting up a constant scrubbing action for burr removal.

An air-actuated cylinder, controlled by a manually operated valve, can pivot the tub through an arc of 130 degrees for easy loading and unloading. The tub is



Almco Vibrasheen finishing machine

lined throughout with 3/8-inch plastisol for extremely long and trouble-free operation. The unit includes a fast-acting, cam-locking, perforated drain door to facilitate flushing of the tub. The vibratory mechanism is adjustable for an impact range of from 600 to 2500 pounds.

Circle 657 on card at back of book

Hoover Spherical Roller Bearing

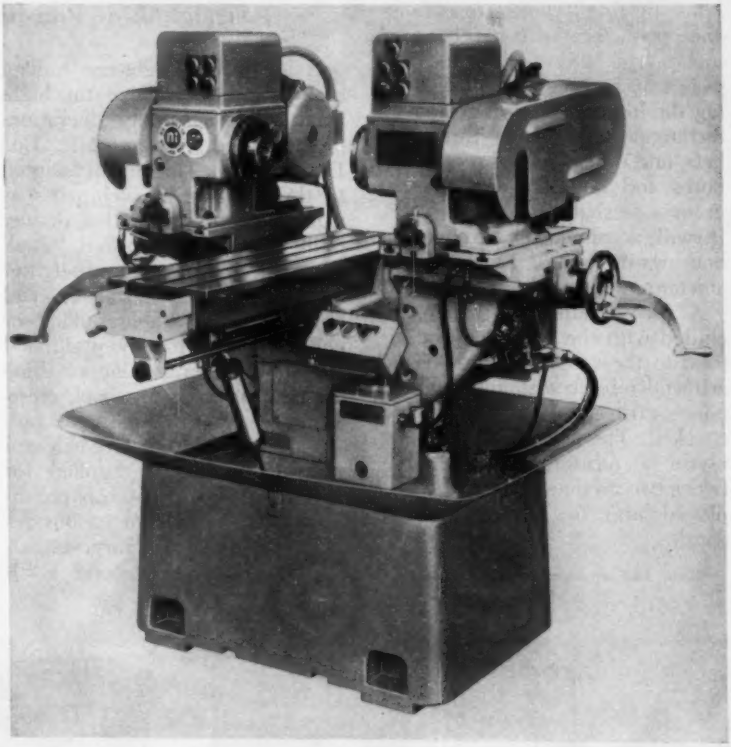
Spherical roller bearings have been added to the line made by Hoover Ball & Bearing Co., Ann Arbor, Mich. The raceways and rollers of the new bearings have working surfaces of exceptional smoothness, which makes possible longer bearing life. The new bearings are designed with a double

row of large-size rollers to accommodate excessively heavy radial and shock loads. High contact angle provides for substantial thrust capacity in either direction. These bearings utilize a single spherical outer raceway that permits them to compensate automatically for shaft misalignment in any direction, either initially or dynamically under load. Accurate roller guidance is assured by a heavy guide flange between the two inner raceways, asymmetric roller design, and heavy machined-bronze, land-riding retainers.

Circle 658 on card at back of book

"Twin Mill" Versatile Duplex Miller

The W. H. Nichols Co., Waltham, Mass., has just announced the introduction of a new version of its versatile "Twin Mill" which has a wider, heavier 36-inch table. This model is also provided with



"Twin Mill" duplex milling machine now available from REM Sales, Inc.

2-hp motors for both milling heads to handle heavier cuts over the 20-inch table feed range. It is available from REM Sales, Inc., West Hartford, Conn. Along with increased cutting capacity and power, the unit is equipped with a fail-safe electrical system which automatically returns all the power feeds to their starting positions in the event of power failure.

Other features include: independent six-way adjustments by micrometer screws for both milling heads; automatic cutter retraction on table return stroke; provision for double table cycling to allow rough and finish cuts at one setting; push-button-controlled, automatic, air-hydraulic, variable table-feed cycle; automatic lubrication of table ways; complete electrical equipment; and removable splash and chip pan.

Available as an attachment is the precision vertical head which fits the "Twin Mill" and all single-spindle models. It is designed to transmit full horsepower at speeds up to 2000 rpm with antifriction

spindle, No. 40 taper, to allow interchangeability of tools with horizontal spindles.

Circle 659 on card at back of book

Groove Location Gage

A micrometer gage which provides an accurate, economical means for locating beveled and rectangular grooves has been developed by the Truarc Retaining Rings Division of Waldes Kohinoor, Inc., Long Island City, N. Y. Known as the "Truarc" groove location gage, it is designed to measure the distance from the outer wall of a beveled or rectangular retaining-ring groove to a reference point located 0.4 inch to 1.4 inches from the groove wall. The gage may be used also for measuring the location of O-ring grooves, rectangular oil grooves, thread reliefs, and other internal recesses in bores and housings and external grooves on shafts and similar parts. It will accommodate grooves in housings or shafts 1.5 inches in diameter or larger.

A special removable flange, included with the gage, may be affixed to the spindle to provide an artificial reference shoulder where none exists in the part being checked. The flange is especially useful for measuring distances between two grooves and may be employed also to measure groove width.

Circle 567 on card at back of book

"Anocut" Spindle for Electrolytic Grinding

The Pope Machinery Corporation, Haverhill, Mass., has announced an "Anocut" spindle (P-19163-AN) for electrolytic grinding which is equipped to operate at 1000 amperes. It employs a 2-hp motor with a speed of 3600 rpm. The spindle is mounted on a heavy-duty universal slide. Attached to the slide are large dial indicators for measuring the feed of the work in ten-thousandths of an inch.

This spindle is representative of a wide range of Pope precision spindles arranged for electrolytic grinding, with built-in insulation and rugged, fork type, cool-operating brush assembly for transmitting low-voltage, high-amperage current to the grinding wheel. These spindles are motorized or belt-driven, to run with wheels up to 28 inches in diameter, and are available to operate from 50 to 3000 amperes, at speeds up to 10,000 rpm. Total eccentricity of these precision spindle shafts is less than fifty millionths of an inch.

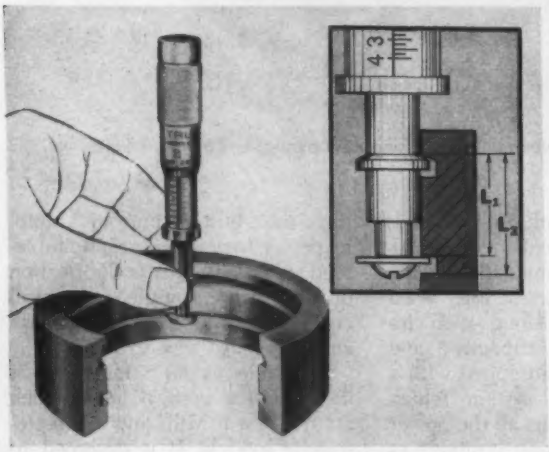
Circle 566 on card at back of book

Straight-Line Polishing and Buffing Machine

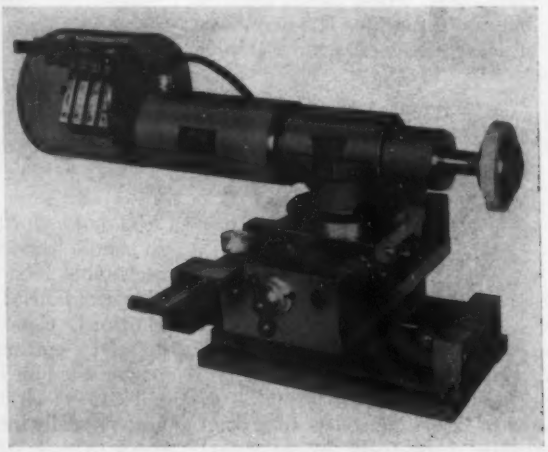
A low-cost, straight-line buffing and polishing machine for high-production, light-duty operations is announced by Acme Mfg. Co., Detroit, Mich. This unit is adapted to the finishing of such parts as nameplates, door handles, drawer pulls, channel extrusions, small moldings, hinges, cigarette-lighter bodies, refrigerator shelves, and ornaments. Adjustable buffing or polishing lathes may be positioned around this straight-line machine for tangent or wide-wheel, cross-cut buffing operations. Acme polishing heads and abrasive-belt arm attachments can be applied for strapping and contact-wheel polishing type operations for various deburring and blending purposes.

The machine consists of a 10-inch-wide, 8-foot-long conveyor unit and suitable Acme adjustable lathes that perform the buffing operations. Additional conveyor sections can be added when finishing requirements call for more lathes. The conveyor has a chain type drive and individual platens that carry the work-holding fixtures. A 3/4-hp motor drives the conveyor through a variable-speed drive that provides conveyor speeds from 10 to 30 feet per minute. Part-loading and unloading operations are carried out at one end of the conveyor.

The platens can be of either horizontal or follower-return type. This means that the part travelling on the return side of the conveyor can face in either the same or the



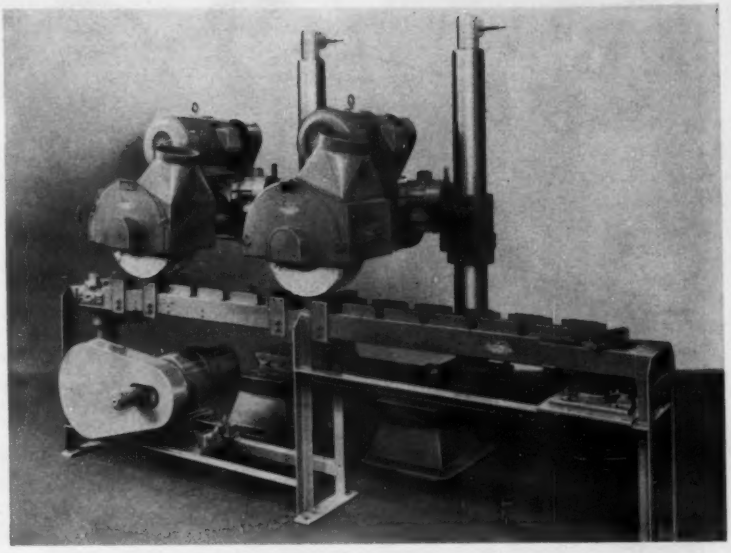
Typical double-groove arrangement of the Truarc groove location gage



Pope Anocut spindle designed for electrolytic grinding operations

opposite direction as those on the infeed side. The machine illustrated has two Acme standard Model G-1 adjustable lathes operating in conjunction with the conveyor unit. The lathes are set up with split buffs that provide combination cutting and coloring operations for finishing nameplates.

Circle 660 on card at back of book

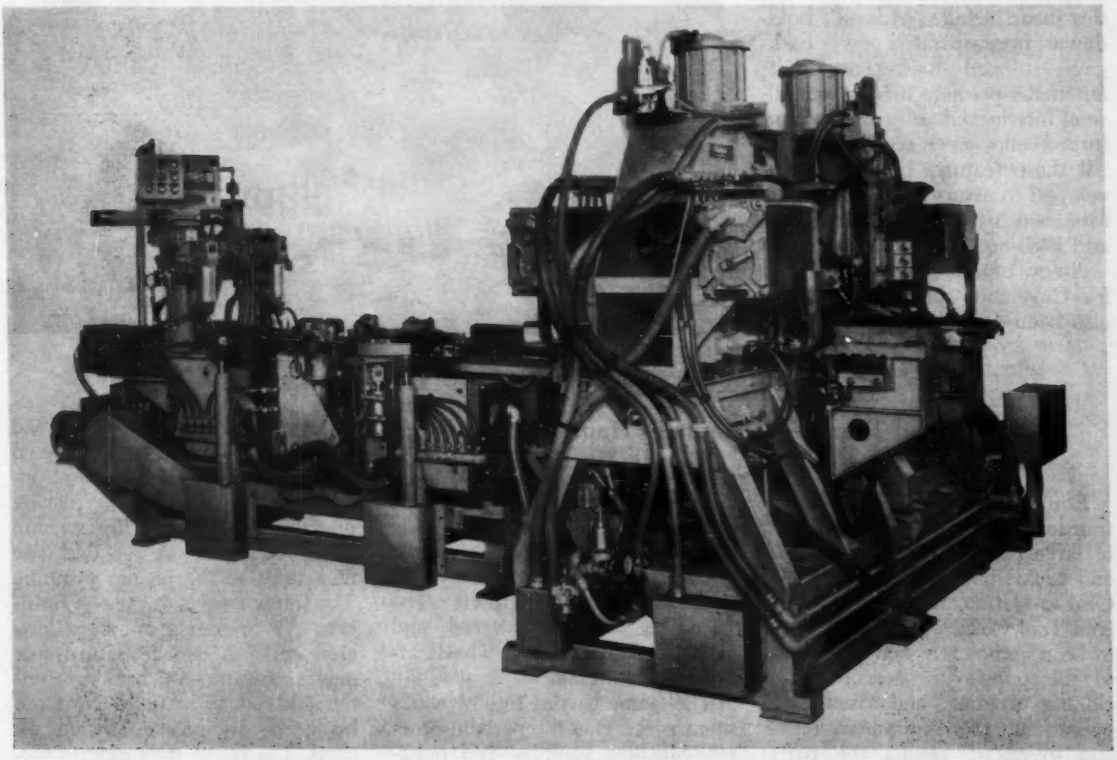


Straight-line polishing and buffing machine for high-production, light-duty parts

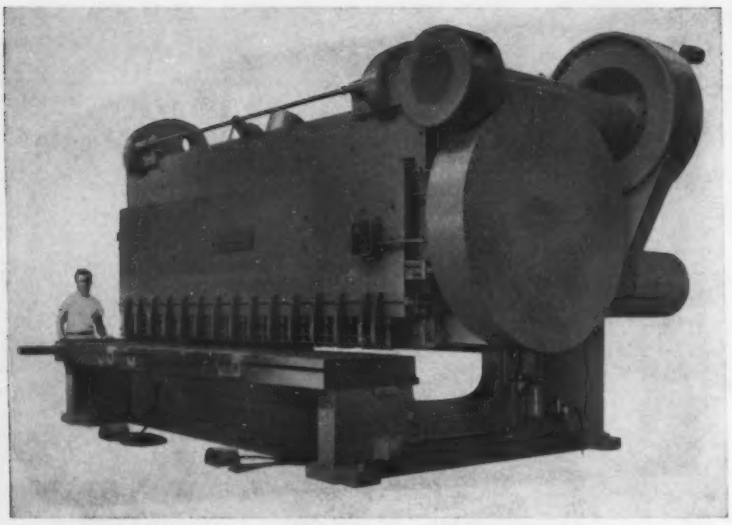
Federal Multiple-Gun Combination Spot and Projection Welder

A special multiple-gun, flat-top, combination spot and projection welder equipped with bending unit has been developed by the Federal Machine & Welder Co., Warren, Ohio. This machine forms and welds range oven frames at a rate of 165 assemblies per hour.

Circle 573 on card at back of book



Federal special machine for forming and welding range oven frames



▲ Fig. 1. All-steel shear announced by Cincinnati Shaper Co. ▼ Fig. 2. Cincinnati front-controlled power back-gage

Cincinnati All-Steel Shear and Power Back-Gage

The Cincinnati Shaper Co., Cincinnati, Ohio, is introducing a Series 15014 all-steel shear, Fig. 1, with a capacity for cutting 1 1/4-inch-thick mild steel plate 14 feet long. New features incorporated in this shear include: hydraulic hold-downs; front-operated power back-gage; hinged back-gage angle; automatic pressure lubrication; all-steel interlocked construction; and forged alloy-steel eccentric shaft. All these features have been developed to assure outstanding performance with low maintenance and high accuracy.

A new type of power back-gage for Cincinnati shears, Fig. 2, has also been announced by the company. Important features of this front-controlled power back-gage are: back-gage control buttons and gage-setting indicating dials built into one unit; large, easy-to-read counter type dial which shows the back-gage setting directly in inches and sixty-fourths of an inch; control unit conveniently located directly in front of the operator and back-gage setting dial at a level that facilitates reading; control buttons that are easy to reach; and a heavy steel frame that protects the dial and control buttons against damage from crane-supported work.

Circle **682** on cards facing back cover

Overhead Transfer Automates Handling of Large Parts Between Existing Machines

Equipment for the automatic transfer from machine to machine of large parts, such as axle shafts and tanks, has been designed by Gear-O-Mation, division of Michigan Tool Co., Detroit, Mich. Said to be a completely new approach to the transfer process for machining, welding, and assembling operations, this equipment operates overhead, raising the parts above the machines to index them to succeeding stations. The basic section of this transfer mechanism is a single "box frame" supported above the production line by several "arch" type supports. The frame is cylinder-powered and rides on flanged guide wheels affixed to the arches.

The frame carries sets of hooks upon which ride the parts in process. Machine spindles and hook-sets are set at constant and equal intervals. Hook-sets are raised and lowered in unison by individual lift cylinders. The sequence of operations begins with the placing of the parts on the "load" chute from which they are released, one at a time, to the pickup position. The frame travels to "at rest" position. All hook-sets are then lowered and "on demand" the frame moves forward until hooks are under parts at all stations. Next the hook-sets are raised, lifting all parts. The frame then indexes forward, transferring all parts to

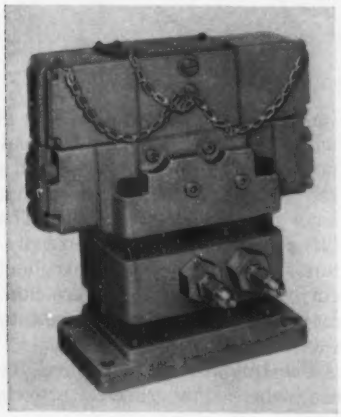
loading tables at succeeding stations. Hook-sets are then lowered, releasing the parts onto the loading tables. The last hook-set then places the finished part on the "unload" chute. The frame then backs off and the hook-sets are raised. The frame returns to "at rest" position and the cycle repeats, upon receiving a signal from the station having the slowest machining time.

When the parts are placed on the loading tables, they are held with either centering wheels or V-clamps, depending upon the specific operation. Tables are prepositioned to give overhang needed for the part to enter the machine. When the part is in position on the table, the entire table top is "cylindered" forward, inserting the part in the machine. Because of flexibility imparted by centering wheels and V-clamps, tables can handle parts of various lengths and diameters, as well as load parts into many different types of machines.

Circle **582** on cards facing back cover

Pipeless Control Valve

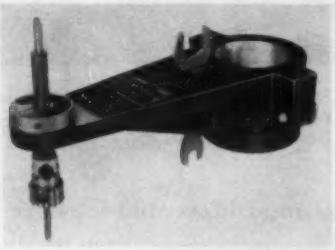
Three-quarter-inch dual flow-control valve with integral check announced by Double A Products Co. (a subsidiary of Brown & Sharpe Mfg. Co.), Manchester, Mich. The Model YP-175 is a non-pressure-compensated valve that provides for separate, adjustable metering-out of fluid in both cylinder lines. It is one of a new series of valves carrying the name "CircuitStak," and is installed by being sandwiched between a 1/2-, 3/4, or 1-inch solenoid controlled, pilot-operated valve (such as a Double A valve Model QM-175) and the sub-plate. The stacking of circuit components in this manner eliminates all interconnecting pipes, and permits additions to the circuit without panel alteration or piping.



Circle **597** on cards facing back cover

Ettco Lead-Screw

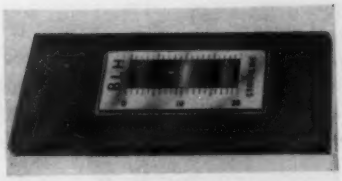
"Auto-Tap" lead-screw tapping attachment of complete line now being manufactured by Ettco Tool & Machine Co., Inc., Brooklyn, N. Y. This unit, a support-arm attachment which fastens to round-column drill presses, can be used with any reversing type head to convert the drill press into a precision tapping machine. With this unit, no special skills are required to precision-tap holes without danger of thread damage. The "Auto-Tap" attachment consists of a support arm and support-arm clamp, and a precision-ground lead-screw and split nut, both of which are interchangeable to permit tapping a variety of threads.



Circle **604** on cards facing back cover

Direct-Reading Strain Gage

"B-L-H Strainline" photoelastic strain gage, designed with virtually zero lateral sensitivity, announced by the Electronics & Instrumentation Division of Baldwin-Lima-Hamilton Corporation, Waltham, Mass. This device is a direct-reading, uniaxial strain indicator. Unlike other photoelastic strain devices, it indicates axial strain in the direction of gage application only. In addition to axial static and dynamic strains, lateral bending and torque are also indicated. No external instrumentation or connections are required. Instead, linear displacement of visible interference fringes indicates strain magnitude. Because of built-in polarizers, Strainline gages may be used easily in natural or artificial light. They are small, rugged, and easily installed on any surface or material. Groups of these gages may be observed or photographed together to provide instantaneous indication of stress distribution over a relatively large area. B-L-H Strainline gages are currently being produced in two types: Type A-75-10 with a 3/4-inch gage length and Type A-200-10 with a gage length of 2 inches.



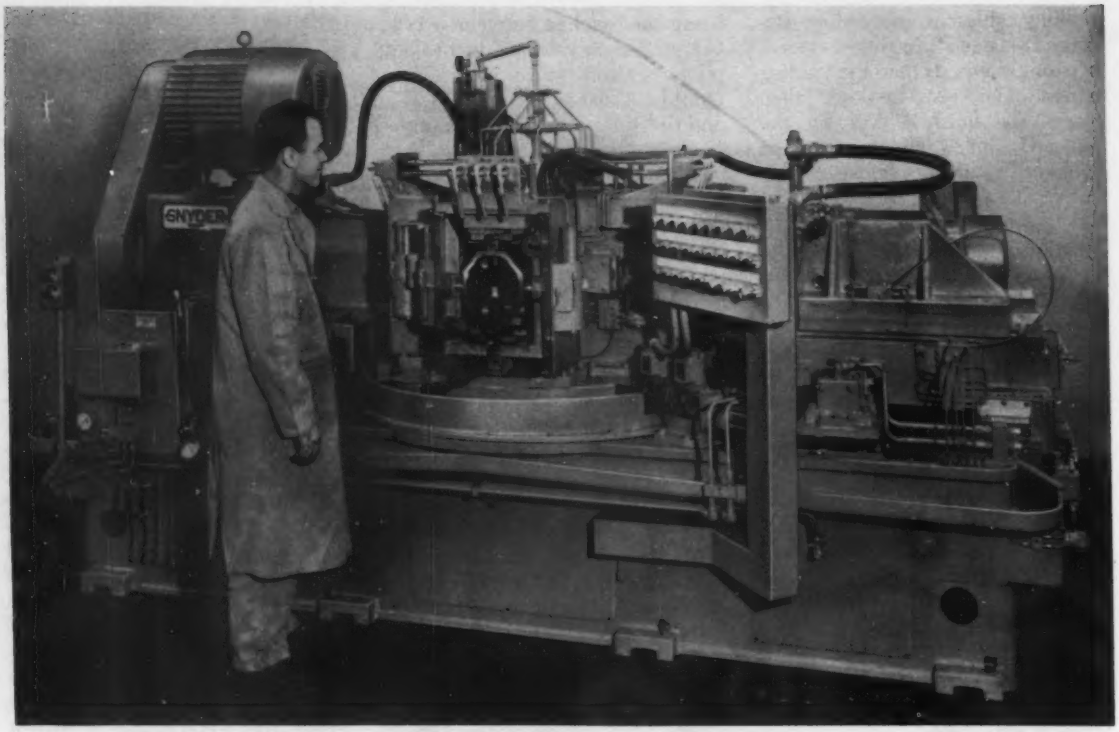
Circle **598** on cards facing back cover

Airco Nonferrous Welding Rod

A versatile nickel-silver gas welding rod, designated Airco No. 21, is being marketed by Air Reduction Sales Co., a division of Air Reduction Co., Inc., New York City. Capable of joining fourteen different metals, this rod can be used to replace many conventional bronze, steel, and cast-iron welding rods in production and maintenance torch applications where the base metal may be heated to 1750 degrees F.

Formulated for superior flow and bonding properties, it can be used with mild, cold-rolled, hot-rolled, hot-carbon, tool, cast, and stainless steels, as well as cast iron, Inconel, Monel, copper, copper nickels, bronze, and malleable iron. This gas welding rod can be applied in all positions without fuming or overheating the base metals. It is available in 36-inch lengths in 1/16-, 3/32-, 1/8-, 3/16-, and 1/4-inch diameters, packaged in 10-pound boxes.

Circle **605** on cards facing back cover



Snyder special three-way machine that mills, drills, chamfers, and reams differential carriers at a rate of eighty-five pieces per hour

Three-Way Machine for Processing Differential Carriers

A special three-way dial-index machine that mills, drills, chamfers, and reams malleable-iron automotive differential carriers at a maximum rate of eighty-five pieces per hour has been developed by the Snyder Corporation, Detroit, Mich. This machine utilizes cross-feed heads in all work stations to carry out face milling at one station, drilling and reaming operations at the second station, and the milling of pedestal pads in two positions at another station.

The differential carriers are loaded into a fixture on the index table in Station 1 and clamped by an air-cylinder-controlled mechanism. The fixture includes air-actuated, wedge type jacks that support the part securely for the subsequent heavy-machining operations. At Station 2, the face of the carrier is milled by cross-feeding a large-diameter face-milling cutter. In Station 3, a pair of locating holes is drilled and chamfered in one position. The head then cross-feeds to the second position and reams the previously drilled holes.

In the fourth station a pedestal pad is end-milled in one position and then the head is cross-fed to permit milling the other pad.

The hydraulically operated, electrically controlled push-button machine has machining units mounted on a welded-steel base with hardened and ground steel ways. A Snyder standard index table carries the parts through the machining sequence. Loading and unloading operations are carried out during the machining cycle. Hydraulic power units provide hydraulic pressure for head-travel functions.

Circle **576** on cards facing back cover

"DoALLoy" Tool Bits

"DoALLoy" tool bits made of a cast-alloy cutting-tool material developed to fill the gap between the maximum speed possible with high-speed-steel tools and the minimum speed practical with carbide tools, are now available from the DoALL Co., Des Plaines, Ill. DoALLoy's main properties are derived from cobalt, chromium, and tungsten. Tool bits of this material have a high red-heat hardness substantially beyond temperatures at which high-speed steel tools break down. They do not have as high a red-heat hardness as carbide but have greater shock resistance. The bits also have high transverse rupture strength. They have excellent corrosion resistance and are nonmagnetic and highly resistant to shock and impact.

DoALLoy tool bit

The bits are recommended for use where low surface speeds

cause build-up with carbide tools, when machines lack the power or rigidity to use carbides efficiently, and where greater production is required than can be attained with high-speed steel. Generally, DoALLoy tool bits can be run at cutting speeds 50 per cent to 100 per cent higher than can high-speed-steel bits. They are used for general-purpose work on both ferrous and nonferrous materials and are particularly adapted for operation under heavy loads at high speeds where considerable heat is generated.

DoALLoy tool bits can be ground easily with aluminum-oxide wheels. They are available in 1/4- through 3/4-inch-square bit and two cutoff blade styles.

Circle **595** on cards facing back cover

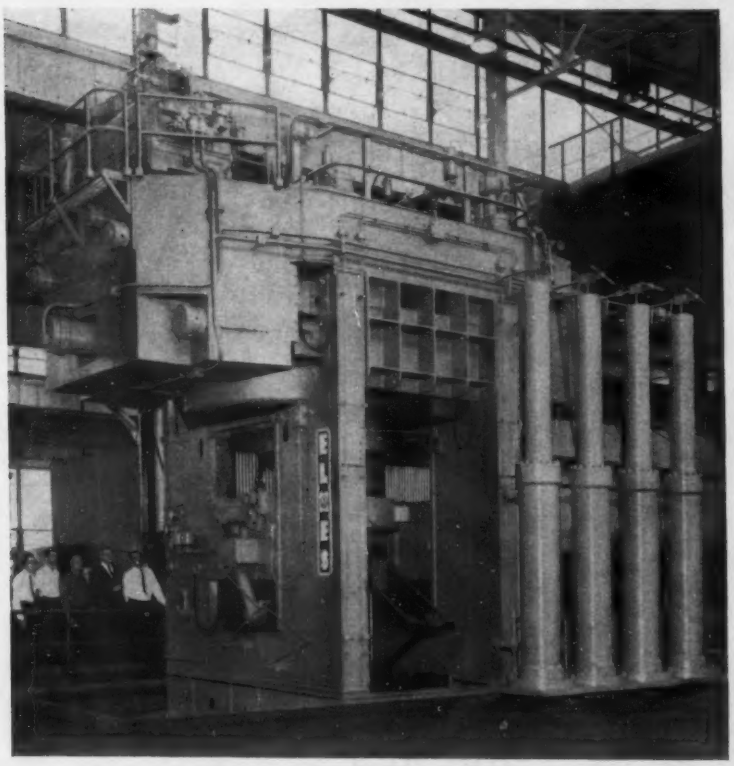
Giant-Size Press Designed for Compacting Various Materials

A huge press, specially designed for the extremely high operational requirements of hydrostatic pressing, was recently completed the Elmes Engineering Division of American Steel Foundries, Cincinnati, Ohio. Said to be the largest of its type ever built, it is over 25 feet high and has an approximate weight of 265 tons. The huge split clamp which holds the compression-chamber head in place is made from castings believed to have the thickest section ever heat-treated in this country.

The press is designed to provide a working pressure of 20,000 psi and a compression-chamber test pressure of 30,000 psi. An Oilgear "DP-10025" variable displacement pump supplies fluid power at a rate of up to 72 gallons per minute to the vessel lift cylinder of the press. The pump is also used to charge and operate the four Oilgear stroke intensifiers which use an input pressure of 2500 psi to build up a 20,000 psi pressure on the output end. Another Oilgear "DPG-202510" variable displacement duplex pump with pressure unloading control supplies fluid power to the "tilt," "clamp," and "wedge" cylinders. Still another Oilgear "HG-850" constant-delivery pump is used to provide a holding pressure of 5000 psi on the clamp cylinders.

For testing purposes after completion of the press, 128 strain gages and seven motion transducers were strategically placed in critical areas of the compression chamber and the chamber clamps. During initial pressure build-up, which was increased from zero to peak operating pressure over a period of thirty-five minutes, 1540 stress readings were taken. These readings showed that the compression chamber and clamps checked with previous theoretical calculations. The press was designed by Elmes engineers in cooperation with the University of California, Los Alamos, Calif., and the U. S. Atomic Energy Commission, Albuquerque, N. Mex.

Circle **590** on cards facing back cover



Elmes giant-size high-pressure compacting press

Maxwell Dial Groove Gage

E-Z dial groove gage announced by Maxwell Industries, Inc., Ashtabula, Ohio, designed for instant, accurate readings of internal groove dimensions. This gage permits inspection without removing the work from the machine and without the use of any micrometer. Its simple lever action and

Continued on page 216

Hughes, a world leader in electronics, brings you:

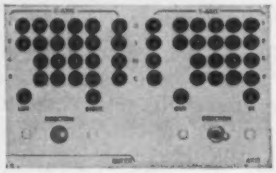
ALL-ELECTRONIC NUMERICAL CONTROL

for *fast, accurate, trouble-free positioning.* Designed with the customer in mind, and backed by experience gained from many years as a leader in research, development and production in the advanced electronics field, the new *all-electronic* Hughes Numerical Control offers you:

Trouble-free operation; easy electrical maintenance: Transistorized circuitry and modularized construction assures you uninterrupted production with low power consumption; simple replacement and repair. *No service contract needed!*

Longer tape life with extra accuracy: Sensitive photo-electric tape reader eliminates deformation of tape holes; reduces possibility of tape wear and tearing. No pneumatic or hydraulic connections required for tape reading operation.

Easier set-up and program checking: Display lights on control panel indicate coordinate dimensions enabling operator to verify the accuracy of programming quickly and easily. Control panel human-engineered for maximum efficiency in operation.



Fast, accurate positioning; easy mechanical maintenance: Drive package positions table at 180 inches per minute; repeatable accuracy: ±0.0002", non-cumulative. Use of standard industrial electric motors and clutches assures quick repairs.

Creating a new world with ELECTRONICS

HUGHES

©1960, HUGHES AIRCRAFT COMPANY

INDUSTRIAL SYSTEMS DIVISION

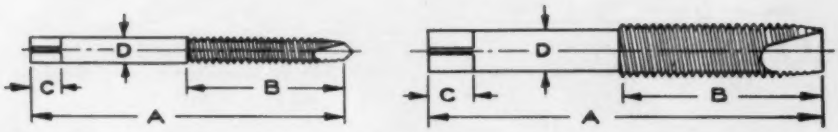
For full information on the application of the *all-electronic* Hughes Numerical Control to your particular problems, please write or wire: HUGHES, Industrial Systems Division, P.O. Box 90904, Airport Station, Los Angeles 45, California. For export information, write: Hughes International, Culver City, California.

Check the exclusive features of the Hughes Numerical Control! See it in operation in Booth 2117 at the ASTE Show, Detroit, April 21-28.

AMERICAN STANDARD CUT AND GROUND THREAD TAPS—9

Spiral Pointed Hand Taps

With Short Flutes
High-Speed Steel—Ground Threads



PLUG

General Dimensions

Diameter of Tap	Threads per Inch		Number of Flutes	Dimensions				
	NC UNC	NF UNF		Length Overall A	Length of Thread B	Length of Square C	Diameter of Shank D	Size of Square E
1/4	20	28	2	2 1/2	1	9/32	0.255	0.191
5/16	18	24	2	2 23/32	1 1/8	5/16	0.318	0.238
3/8	16	24	3	2 15/16	1 1/4	3/8	0.381	0.286
7/16	14	20	3	3 5/32	1 7/16	13/32	0.323	0.242
1/2	13	20	3	3 3/8	1 21/32	7/16	0.367	0.275

All dimensions are given in inches.

These taps are furnished in plug style only in H3 limit.

Short flute spiral pointed hand taps are provided with spiral point only. The balance of the threaded section is left unfluted.

All taps up to 3/8" inclusive have external center on thread end; sizes 7/16" and larger have internal center in thread end.

Tolerances *

Element		Range	Direction	Tolerance
Length Overall	(A)	1/4 to 1/2 incl.	plus or minus	1/32
Length of Thread	(B)	1/4 to 1/2 incl.	plus or minus	1/16
Length of Square	(C)	1/4 to 1/2 incl.	plus or minus	1/32
Diameter of Shank	(D)	1/4 to 1/2 incl.	minus	0.0015
Size of Square	(E)	1/4 to 1/2 incl.	minus	0.004

All dimensions are given in inches.

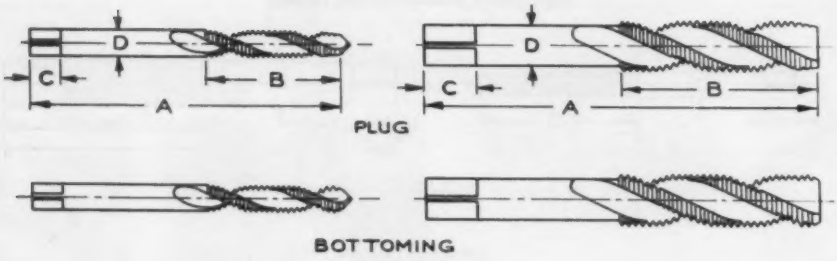
* For eccentricity tolerances of tap elements, see Table in MACHINERY's Data Sheet, published in Febr. ry, 1960, page 186.

Extracted from American Standard Taps—Cut and Ground Threads (ASA B5.4-1959), with the permission of the publisher, the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

AMERICAN STANDARD CUT AND GROUND THREAD TAPS—10

Helical (Spiral) Fluted Hand Taps

High-Speed Steel—Ground Thread



General Dimensions

Diameter of Tap	Threads per Inch		Number of Flutes	Dimensions				
	NC UNC	NF UNF		Length Overall A	Length of Thread B	Length of Square C	Diameter of Shank D	Size of Square E
1/4	20	28	2 or 3	2 1/2	1	9/32	0.255	0.191
5/16	18	24	2 or 3	2 23/32	1 1/8	5/16	0.318	0.238
3/8	16	24	2 or 3	2 15/16	1 1/4	3/8	0.381	0.286
7/16	14	20	3	3 5/32	1 7/16	13/32	0.323	0.242
1/2	13	20	3	3 3/8	1 21/32	7/16	0.367	0.275

All dimensions are given in inches.

These taps are furnished in plug or bottoming style in H3 limit and have a right hand spiral flute with a Helix angle of from 25 to 35 degrees.

All taps up to 3/8" inclusive have external center on thread end; sizes 7/16" and larger have internal center in thread end.

Tolerances*

Element		Range	Direction	Tolerance
Length Overall	(A)	1/4 to 1/2 incl.	plus or minus	1/32
Length of Thread	(B)	1/4 to 1/2 incl.	plus or minus	1/16
Length of Square	(C)	1/4 to 1/2 incl.	plus or minus	1/32
Diameter of Shank	(D)	1/4 to 1/2 incl.	minus	0.0015
Size of Square	(E)	1/4 to 1/2 incl.	minus	0.004

All dimensions are given in inches.

* For eccentricity tolerances of tap elements, see Table in MACHINERY's Data Sheet, published in February, 1960, page 186.

Extracted from American Standard Taps—Cut and Ground Threads (ASA B5.4-1959), with the permission of the publisher, the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

WEAR RESISTANT
THOMSON

60 Case

AVOID the HIGH COST and difficulty of fabricating long, hard & straight parts by conventional methods!

hardened and ground

SHAFTS, ROLLS, GUIDE RODS and other long-round parts

ELIMINATE WEAR and REDUCE COST

60 Case is the result of over 15 years of experimental work and production experience with hardened and ground shafts which are a requirement for BALL BUSHINGS, the Linear Ball Bearing manufactured by Thomson Industries, Inc.

The special techniques and equipment that have been developed enable high production rates and low handling costs. This permits big savings over conventional methods which are plagued with erratic warpage, straightening and resultant grinding problems. Finished *60 Case* parts frequently cost less than the scrap losses that result from conventional methods.

60 Case material has a surface hardness close to 60 on the Rockwell C scale which is essential to resist wear.

Long lengths of material ranging in diameter from ¼" to 4" are stocked to enable prompt shipment of *60 Case* parts, with or without special machining. *Write for literature and name of your local representative.*

For emergency needs call collect
MAnhasset 7-1800

ADVANTAGES of *60 Case*

- COST REDUCTION
- HARD BEARING SURFACE
- NICK-& DENT-PROOF
- ACCURATE DIAMETERS
- GROUND FINISH
- STRAIGHT PARTS
- DELIVERY FROM STOCK
- ADDED STRENGTH
- UNIFORM HIGH QUALITY

TYPICAL *60 Case* PARTS

GUIDE RODS • SHAFTING • ROLLS • TRAVERSE RAILS
PISTON RODS • ARBORS • LEADER PINS • TIE RODS
KING PINS • AXLES • CONTROL RODS • GUIDE POSTS
MANDRELS • BEARING ROLLERS • SPINDLES

THOMSON INDUSTRIES Inc.
Dept. C-9, Manhasset, New York

PARTS HARDENED to 60 C...
increase life...reduce cost!

Continued from page 211

easy-to-read dial indicator provide a measuring range from 0.2 inch to 1.6 inches, with the small dial reading to the nearest hundredth of an inch and the large dial hand indicating the nearest half-thousandth of an inch. Each gage has an approximate range of 0.4 inch in the smaller sizes, while the larger sizes have a range of 0.8 inch. Accurate to fractions of 0.0005 inch, it saves time where fast, accurate readings are important. Maxwell's complete line of four E-Z dial groove gages has a range of location depths from 15/16 inch to 2 3/8 inches. The gages are capable of measuring grooves from 0.080 inch deep on the smallest gage to 0.350 inch on the largest gage.

Circle **603** on cards facing back cover

Combination Belt and Disc Finishing Machine

A combination abrasive belt and disc machine, designed to perform all kinds of finishing operations, has been introduced by the Rockwell Mfg. Co., Delta Power Tool Division, Pittsburgh, Pa. The equipment has a standard 4-inch abrasive belt and a 12-inch abrasive disc arranged to handle custom or production finishing work efficiently and economically. It is especially adapted for use in wood and metal pattern shops, and in all types of maintenance shops. Also it is particularly suitable for use in school shops. It can handle all kinds of finishing work on wood and plastic materials, as well as perform grinding, surfacing, or polishing operations on steel components, die castings, aluminum, brass, and copper parts.

The machine is also particularly suitable for sharpening tools. A specially designed idler-drum guard facilitates hollow grinding of wood chisels, lathe chisels, carving tools, and plane irons. There are no wheels to "dress," and quenching in water is not necessary.

The 4 1/4- by 12-inch platen can be inverted for underside general finishing or deburring operations on small, hard-to-handle parts. A removable end guard permits inside contour-finishing operations on the idler drum. The 9 3/4- by 16 1/4-inch table furnishes ample work support for finishing large patterns. The fully machined disc is balanced for vibration-free operation to assure accurate finishing on close-tolerance patternmaking work.

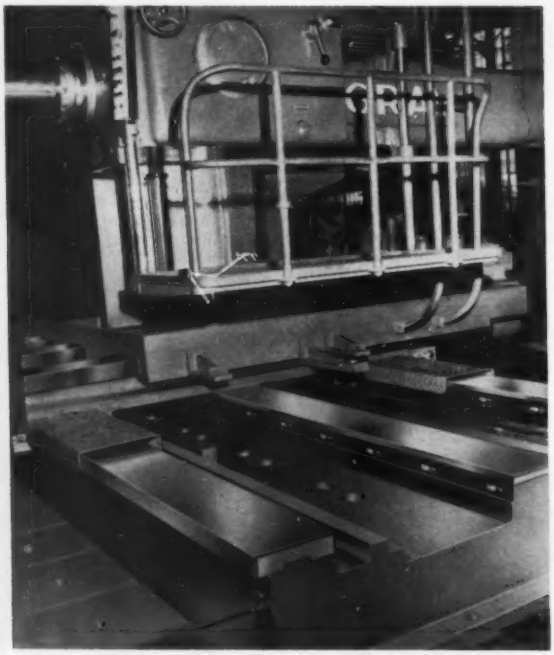
Circle **581** on cards facing back cover

Boring Mills with Hardened Ways

The G. A. Gray Co., Cincinnati, Ohio, has announced that hardened ways made by the Ohio Knife Co., Cincinnati, Ohio, are being offered as optional equipment on Gray horizontal boring mills. These O-KNI-CO hardened and ground bedways and cross ways, in addition to their high precision and accuracy, provide exceptional wear-resistant qualities and contribute considerably to the over-all efficiency of the machine. These hardened ways have a Rockwell C 65 to 66 hardness and are said to be virtually wear-proof. Actual tests have proven that 1045 cold-rolled steel can be machined with a section of an O-KNI-CO way.

Circle **588** on cards facing back cover

Delta combination abrasive belt and disc finishing machine



Gray boring mill with hardened ways made by Ohio Knife Co.

SAVE

On Base Price! On Set-up Time! On Maintenance!

Typical parts produced by 2½" Model AW Cleveland, at profitable production rates, with simple tooling. Ask your CLEVELAND representative to submit a cost analysis with production estimates on your work.

REMEMBER,
Clevelands Cut Costs!

with the low-cost CLEVELAND 2½" model AW single spindle automatic

With a base price of $4000 to $5000 *less* than other comparable automatics, this Model AW Cleveland will set an unbeatable production pace in your shop. Not only is it fast, precise and highly versatile, it is a rugged, *fool-proof* automatic, free from complicated mechanisms and controls that require constant adjustment and maintenance.

Quick and easy to set up, this Cleveland features universal camming — rapid, hand crank stock feed adjustment—quick change collet pads—four automatic spindle speeds for each set of pick-off gears. An easily accessible tooling area is provided by wide, independent double cross slides and large diameter 5-hole turret. Forty spindle speeds —69 to 1920 rpm—give you efficient speeds for all types of materials and tools. Forward and return turret tool feeds are infinitely variable through a simplified mechanical drive.

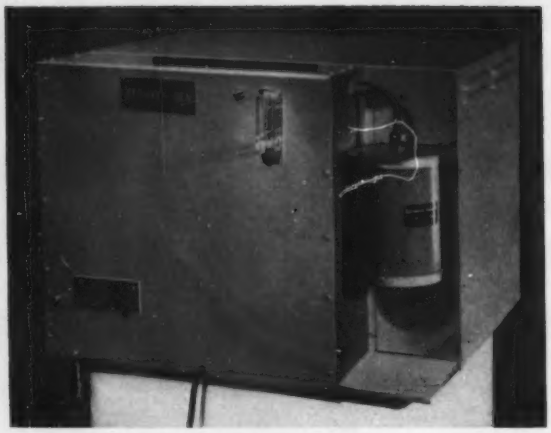
With the 2½" Model AW Cleveland, you can *cut your costs three ways:*—ON BASE PRICE—ON SET-UP TIME—ON MAINTENANCE. For detailed machine specifications, write for AW Bulletin.

Sales Offices: Chicago • Cleveland • Detroit • Hartford • Springfield, N. J.

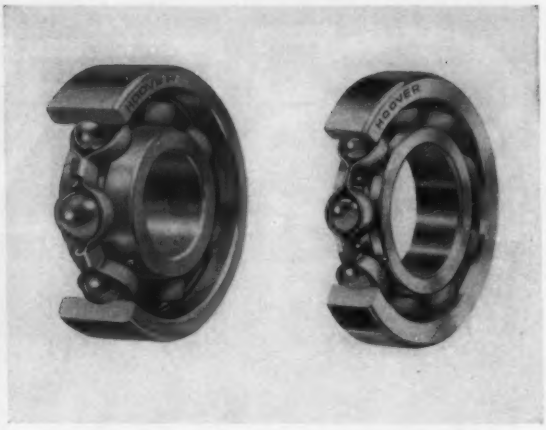
CLEVELAND AUTOMATIC MACHINE COMPANY
4936 Beech Street • Cincinnati 12, Ohio

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

For more data circle this page number on card at back of book



Oxygen-supply unit introduced by the Chemical Division of the Aerojet-General Corporation



Metric and inch dimension ball bearings announced by Hoover Ball & Bearing Co.

"AerOxy-Gen" Oxygen-Supply Unit

A transportable oxygen unit which produces a continuous supply of oxygen from the atmosphere and eliminates heavy steel cylinders has been developed by Aerojet-General Corporation's Chemical Division, Azusa, Calif. This "AerOxy-Gen" unit draws air from the atmosphere, filters out contaminants, and extracts the oxygen for delivery at approximately 5 psi pressure in less than one minute after connection to any 110-volt electrical outlet. The device is only 2 feet square and weighs 150 pounds. It is expected to have wide application in industrial fields for welding and other processes, as well as for use in the medical field.

Circle 568 on card at back of book

Hoover Inch and Metric Dimension Ball Bearings

Two series of ball bearings—one with inch dimensions, the other with metric dimensions—have been introduced by the Hoover Ball & Bearing Co., Ann Arbor, Mich. The new R series bearing, shown at the right in the illustration, facilitates shaft and housing design because all boundary dimensions—bore, outside diameter, and width—are made to convenient inch dimensions. This series is compactly designed and proportionally similar to conventional extra-light and light series metric bearings. R series bearings are offered in fifteen sizes for shafts ranging from 1/8 inch to 1 1/2 inches in diameter.

The 30 series ball bearing, shown at the left, is designed to fulfill the need for extra-small metric ball bearings for use with shafts and housings of small diameter. Bores range from 4 to 9 mm in diameter, smaller than conventional extra-light, light, and medium series.

All of these bearings may be had in either open or shielded types. In addition, the 30 series bearings may be equipped with a single or double seal.

Circle 569 on card at back of book

Aircomatic Welding Gun

Manual Aircomatic (Air Reduction's gas-shielded metal-arc process) welding gun for use on mild steel using carbon dioxide (CO_2) as a shielding gas placed on the market by Air Reduction Sales Co., a division of Air Reduction Co., Inc., New York City. The air-cooled gun, designated Model AH60-B, has a continuous duty rating of 600-amperes direct current when using "buried arc" CO_2 techniques. It can accommodate hard welding wires having diameters ranging from 0.035 through 3/32 inch, which are applied from conventional Airco wire feeders. The gun is equipped with a lever type trigger for simple operation and has a gooseneck nozzle designed to facilitate welding in hard-to-reach areas. The number of cable connections has been reduced by combining both the power cables and the wire casing. No tools are required for disassembly. Replacement parts are inexpensive.

Circle 683 on card at back of book

Hard-facing Electrode

A hard-facing electrode, "Nickel Manganese C," has just been developed by the Air Reduction Sales Co., a division of Air Reduction Co., Inc., New York City. This composite 14 per cent manganese electrode is especially suit-

How the Lindner Jig Borer's Optical Measuring System reduces tooling costs

at F. J. Stokes

Production Jig Boring and Inspection at Stokes—51 holes, .750" diameter, 9" to 15" deep, in head of rotary tablet machine held to +.0005", —.0000" on Lindner Model LB15A. Holes are perpendicular to the base and parallel to each other within .0005".

Lindner Model LB15A has 44" x 24" table with exclusive AUTOPOSITIONER® for pre-selecting initial and repeat table settings.

"*Greater accuracy in jig boring* proved to be the key to more economical tooling," says Bill Kale, Chief Production Engineer at F. J. Stokes Corp., Philadelphia. "When we installed a Lindner, costs were substantially reduced."

How does the Lindner achieve this greater accuracy? Through a unique optical measuring system. Here's how it works:

There are no lead screws. No gage blocks. No bars or limit switches. The helically scribed, cylindrical measuring scales are touched by a light beam *only*. These scales are independent of the table movement mechanism and immovable in axial direction. Thus, the whole system is permanently protected against any mechanical wear whatever. Lifetime accuracy. And lifetime *economy!*

Says Mr. Kale: "Before installation of the Lindner, it was impossible to achieve such consistent accuracy. Manufacture of tooling and laying out complex jobs has now been greatly simplified. And the Lindner optical measuring system makes it possible for us to inspect the work *right in the machine*."

The Lindner optical measuring system is changing ideas about jig boring all over the country. We've packed all the facts into an informative 25-minute movie film. Send for it today without obligation, or write for literature.

KO CO., INC. PRECISION MACHINERY

KURT ORBAN

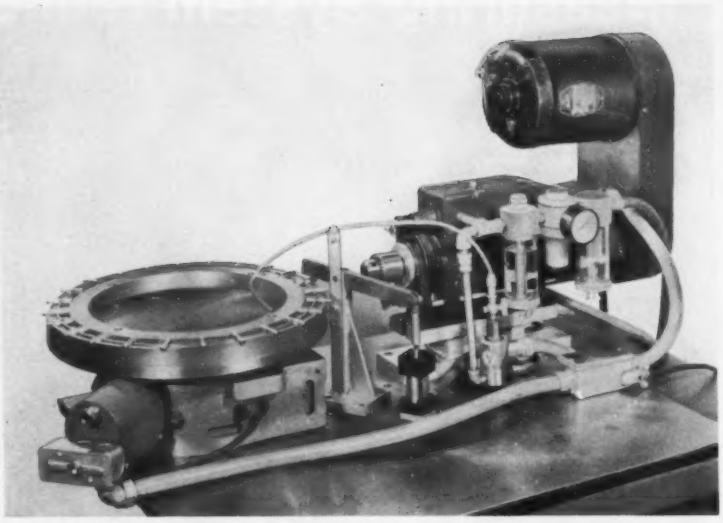
COMPANY, INC.

42 Exchange Place, Jersey City 2, New Jersey

able for smooth, economical build-up of railway manganese frogs and switches and for dipper teeth, bucket lips, crusher hammers, jaws, and screens in the heavy construction industry, or wherever resistance to severe impact is desirable.

The hardness of the deposited metal ranges from 170 to 230 Brinell and it will work-harden to 550 Brinell. The electrode meets AWS-ASTM classification EFeMn-A covered and can be used with either an alternating or direct-current reverse-polarity power source. Effective in all-position work, it is available in standard 14-inch lengths, in diameters of 1/8, 5/32, 3/16, and 1/4 inch. Slag coverage is said to be complete and spatter, low.

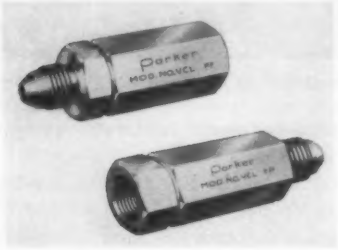
Circle **599** on cards facing back cover



M & M Roto-Spacer indexing table

Parker Check Valves

Two models of hydraulic check valves for 3000-psi operating pressure added to line manufactured by Parker Hydraulics Division, Parker-Hannifin Corporation, Cleveland, Ohio. These check valves are for in-line mounting, with internal pipe thread connecting port in one end and "Triple-lok" machining on the other end for JIC flared tube connection.



Circle **601** on cards facing back cover

"Roto-Spacer" Indexing Table

An electronic rotary indexing table for positioning work on which numerous operations, such as assembly drilling, staking, and tapping, are to be performed has been announced by the M & M Tool & Mfg. Co., Dayton, Ohio. A special feature of this "Roto-Spacer" prevents work-heads from operating unless the index shot-pin is in the operating position.

The index plunger is designed to locate the table to within 0.001 inch of true position repeatedly. The index-plate is hardened steel. Special screws can be inserted in indexes that are not needed, thus making it possible to work out a combination of indexes to suit a specific job. The standard table has twenty-four stations and two, three, four, six, eight, twelve, and twenty-four indexes are possible. Three sizes of work-holding plates (12, 15, and 20 inches in diameter) are available. A 110-volt, 60-cycle gear-head drive and variable-speed control unit are provided. The 15-inch Roto-Spacer table shown is equipped with an air-operated drill head for second-operation parts. A switch prevents jamming of tools synchronized with the drill head.

Circle **684** on cards facing back cover

Vanadium End Mills for Hard Abrasive Materials

The DoALL Co., Des Plaines, Ill., has announced a standard line of end mills designed for machining abrasive materials. These tools are made of vanadium high-speed steel and have higher red-heat hardness and substantially more abrasion resistance than conventional tools of M-2 steel.

Prehardened materials with a hardness of 30 to 40 on the Rockwell C scale and the newer, tough-to-cut, high-strength, high-heat resistant materials can be successfully machined with these end mills.

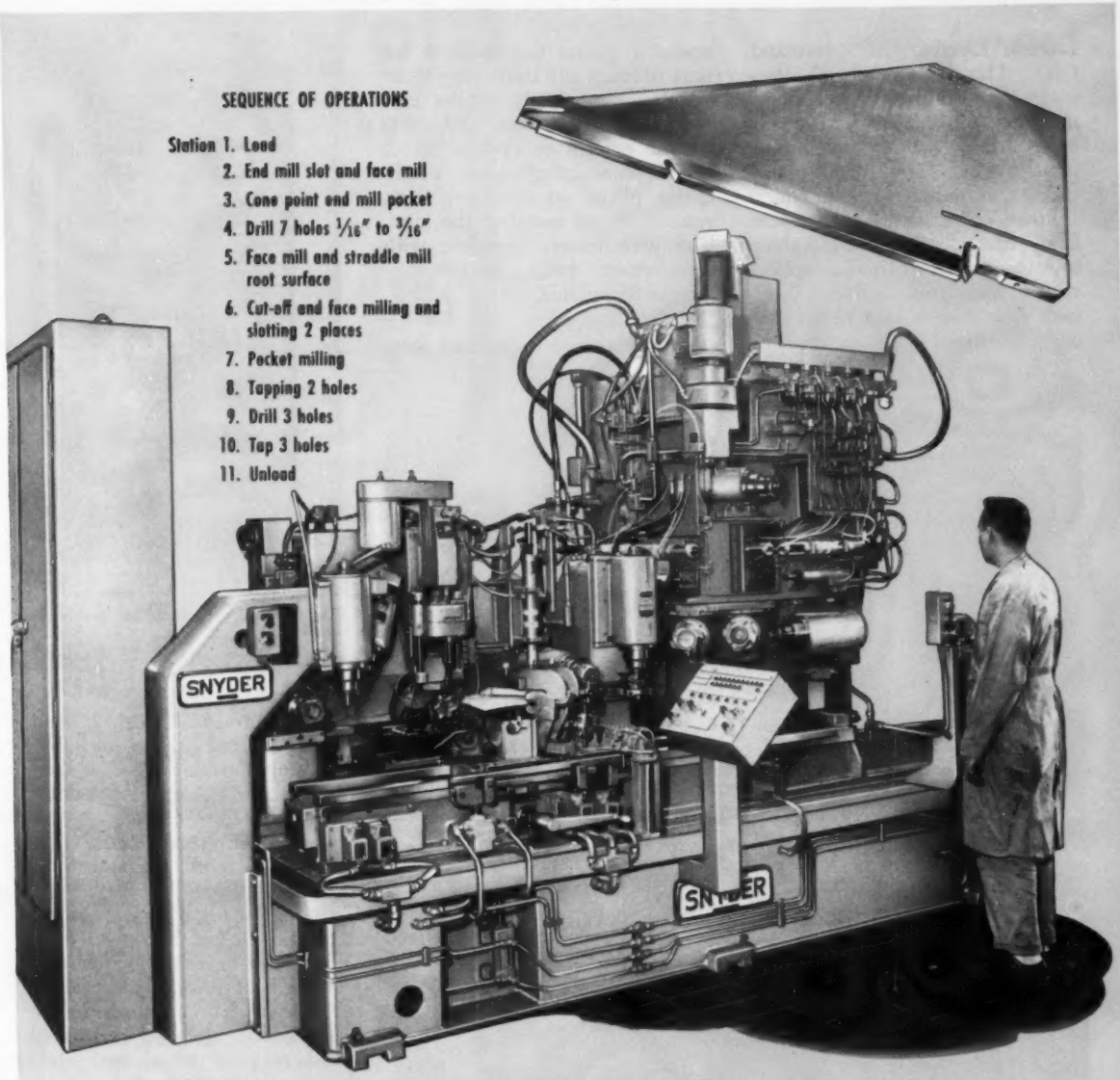
Vanadium high-speed-steel end mills are standard with two, three, four, and six flutes in sizes from 3/8 inch through 2 inches in diameter. Four-flute center-cutting end mills in miniature sizes starting at 1/32 inch in diameter and larger sizes 2 inches in diameter and over with Sure-Lock shanks have also been added to the DoALL line.

DoALL end mill for hard materials

Circle **593** on cards facing back cover

Lincoln Electric "Wire Joiner"

A resistance butt welder designed for continuous wire feeding has been developed by the


SEQUENCE OF OPERATIONS
Station 1. Load
2. End mill slot and face mill
3. Cone point end mill pocket
4. Drill 7 holes 1/16" to 3/16"
5. Face mill and straddle mill root surface
6. Cut-off and face milling and slotting 2 places
7. Pocket milling
8. Tapping 2 holes
9. Drill 3 holes
10. Tap 3 holes
11. Unload
SNYDER
SNYDER

COMPLEX MISSILE WING GETS 24 PRECISION OPERATIONS IN SPECIAL SNYDER PROGRAMMING TOOL

at Martin Company's Baltimore Division

Production rate, tolerances and part configuration dictated the fundamental design concept of this exceptionally compact tool which has 11 stations and performs 24 operations.

The cycle can be automatic, semi-automatic or manual. Controls for multiple cycle operations are provided by utilizing basic circuits triggered by a programming control device.

SNYDER
CORPORATION
(Formerly Snyder Tool & Engineering Company)

3400 E. LAFAYETTE—DETROIT 7, MICHIGAN
Phone: LO 7-0123

For more data circle this page number on card at back of book

Lincoln Electric Co., Cleveland, Ohio. This "Wire Joiner" eliminates time delay from reel changing and wire threading in submerged-arc welding as well as in other types of industrial operations using wire fed from a coil.

Powered by a compact 60-cycle, 220- to 440-volt, single-phase transformer, the welder splices wire in sizes from 5/64- to 7/32-inch diameter in one to six seconds. To make joints in wire, the operator places the ends of the wire in tongs and starts the welder which automatically applies current, upsets the joint, and shuts off the current on completion of the time welding cycle. Flash-cutter pliers, an accessory item, remove excess metal at the joint. The wire joiner, complete with transformer, tongs, and cable, weighs 35 pounds.

Circle **600** on cards facing back cover

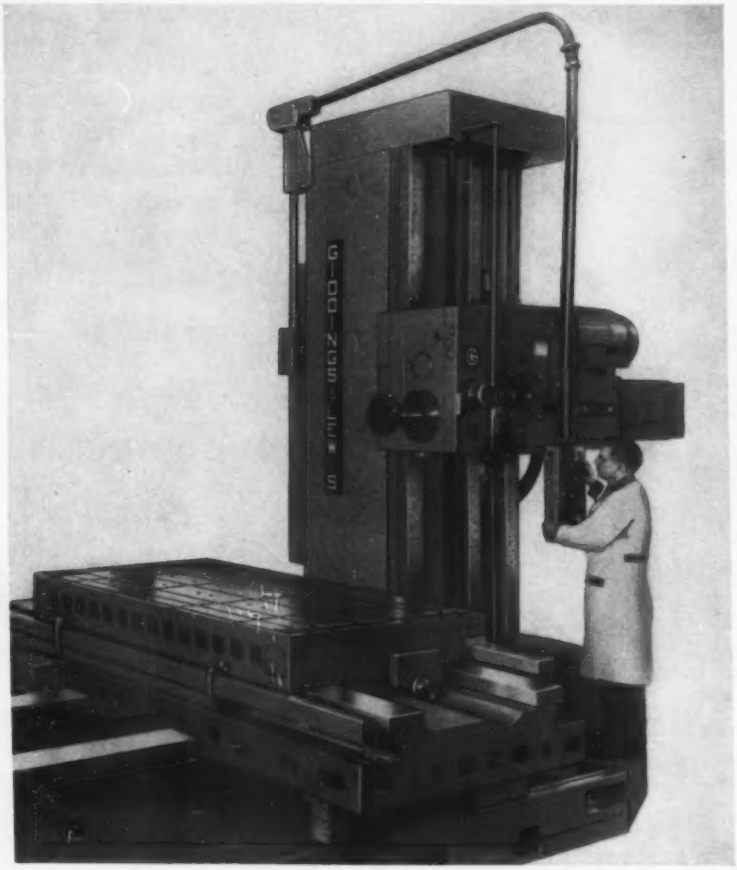


Fig. 1. Pendent-controlled Giddings & Lewis horizontal boring, drilling, and milling machine.

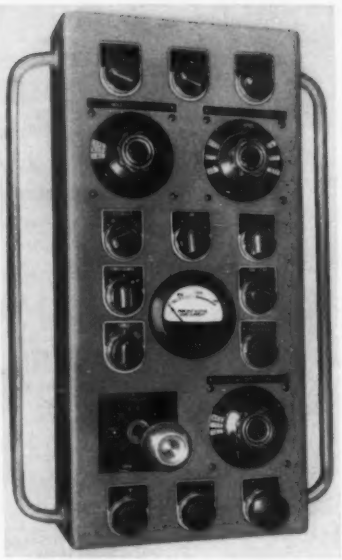


Fig. 2. Pendent control for machine shown in Fig. 1.

Giddings & Lewis Pendent-Controlled Horizontal Boring, Drilling, and Milling Machine

Complete pendent control of every machine function, "joy-stick" control of milling feeds, a three-way column, and a motorized headstock are outstanding features of a table type horizontal boring, drilling, and milling machine, Fig. 1, developed by Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Designed as a 6-inch spindle machine with a 30-hp or larger main-drive motor, it also is available as a 5-inch spindle machine.

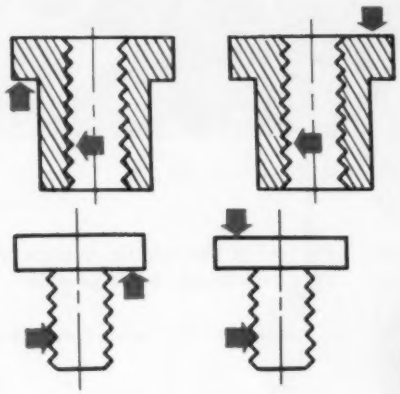
The pendent, Fig. 2, provides remote control of headstock, spindle, table, and saddle, including start, stop, direction, traverse, feed, speed, and clamping. Independent saddle and spindle feeds, as well as combination saddle and spindle feed for smooth, uninterrupted machining of long bores, are provided. Head, table, and saddle milling feeds can be operated independently or in any combination. Clamping of head, table, saddle, and spindle is by electrohydraulic mechanisms. Spindle feeds and speeds may be pre-selected while the spindle is running.

"Joy-stick" directional control for milling feeds and rapid traverse to headstock and table are unique features. Moving the stick up or down traverses the headstock up or down; moving the stick to the right or left moves the table to the right or left. Moving the stick at any of four 45-degree angles causes the headstock and table to move simultaneously in the desired directions. This speeds tool positioning and also facilitates rough contouring. Rapid traverse is accomplished by pushing a button in the control knob.

The machine is designed to receive all automatic control systems, including Giddings & Lewis "Numeripath" or "Numeripoint" controls, as well as other makes of

USING OR PRODUCING small THREADED PARTS?

Check Squareness of Face Fast, Easily, Accurately!



NEW BRYANT ATTACHMENT CHECKS PARTS UNDER 2″ DIAMETER...

Now, with one easy-to-use attachment, you can double the versatility of your present Bryant Bench Gages at minimum cost.

Mounted on the workholder post of the B-21 Bench Gage, the 9104-B Squareness of Face Attachment quickly checks true face run-out in relation to thread axis on parts with face diameters measuring 0 to 2″.

If you take pride in your quality control, complement your other fine inspection equipment with this new Attachment. You get famous Bryant precision, plus these cost-saving features:

- Precise, visual reading of face run-out
- Checks both over and under faces
- Checks narrow and hard-to reach faces
- Accurate check regardless of thread tolerance
- Permits simultaneous check of thread size and face run-out
- Contact points adjustable to 2″
- Choice of .0005″ or .0001″ dial indicators
- Requires no gage modification

FREE—Send today for the complete fact-story on the Bryant B-21 Bench Gage. See how it checks parts with internal and external threads to 5″ dia., parts with special grooves, snap ring or O-ring grooves, and checks face squareness and concentricity of diameters—and does it 8 to 10 times faster!

EX-CELL-O CORPORATION 60-19

Greenville Plant: 945 E. Sater St., Greenville, Ohio

EX-CELL-O FOR PRECISION

EX-CELL-O PRECISION PRODUCTS INCLUDE: MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS DRILL JIG BUSHINGS • TORQUE ACTUATORS • GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • ATOMIC ENERGY EQUIPMENT AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Precision-made to meet your standards of precision . . .

PORTABLE THREAD & GROOVE GAGES

THREAD & GROOVE BENCH GAGES

QUARTZ GRANITE SURFACE PLATES

GUN-TYPE GROOVE GAGES

numerical control, electronic or hydraulic tracer, and electric positioning. At moderate additional cost, a standard machine can be modified at the factory for retrofitting with Numeripoint control in the field at a later date. Several types of table and saddle arrangements are available. These include two-way bed, two-way bed with in-the-floor supports, four-way bed, and four-way bed with in-the-floor or over-the-floor supports.

Standard equipment includes scales and adjustable verniers for accurate measurement of table and headstock motions to 0.001 inch; fine-feed microdials calibrated in 0.001 inch for headstock, table, and saddle motion; automatic spindle-feed trip over the full range of spindle travel; a mechanical spindle-readout device reading to 0.001 inch; antifriction open-side end supports; travel-limit safety switches for all machine elements; and automatic lubrication to all gears, bearings, and way surfaces.

Machines are available with a complete line of optional equipment, accessories, and attachments, including various measuring and coolant systems, chip conveyors, special tables, controls, etc. They will also be available in floor and planer types.

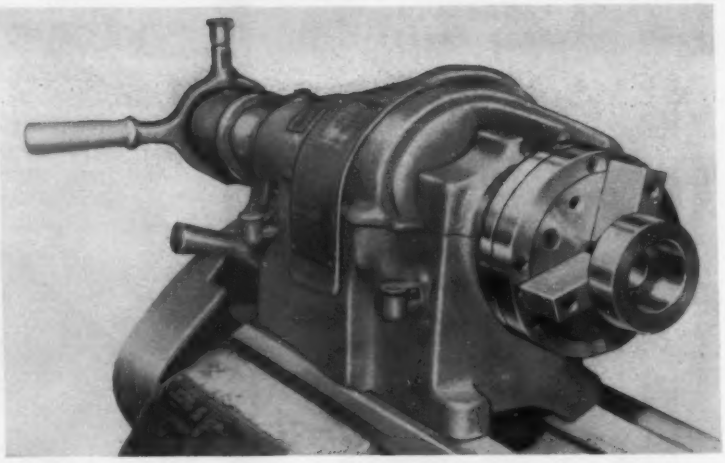
Circle **578** on cards facing back cover

PowerGrip Precision Chuck

A Model 1000 5-inch precision chuck for use on high-speed lathes, boring machines, and grinders is announced by PowerGrip, Inc., Rockfall, Conn. This chuck is supplied with blank-top jaws, which are designed to be bored out to fit the work-piece. It is built to accuracy limits of less than 0.0005 inch and will hold work having a maximum outside or inside diameter of 3 1/2 inches. The chuck has a 3/4-inch hole which permits coolant to be piped through the spindle.

The chuck can be operated either by an air cylinder or by a lever type collet closer. The operator can change over from the chuck to collets in a few minutes.

A PowerGrip actuator is available to operate the chuck. This actuator provides controlled and uniform holding pressure, regardless of variations in the work-piece diameter. The face of the chuck extends only 1 3/8 inches beyond the end of the spindle. Weight of the chuck is only 8 1/2 pounds.



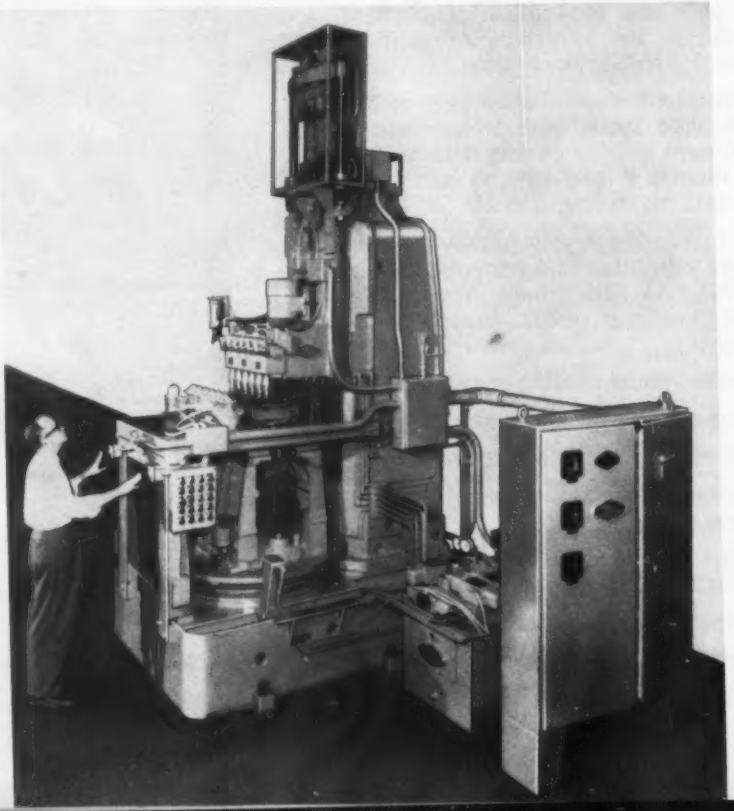
Precision chuck made by PowerGrip, Inc.

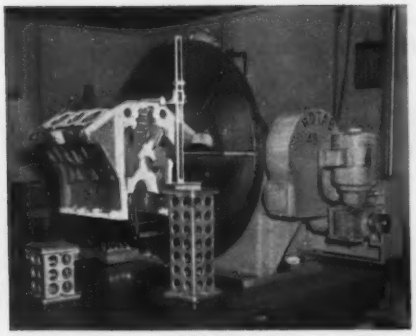
Circle **618** on cards facing back cover

Automatic Six-Spindle Valve-Seat Grinding Machine

A new automatic six-spindle valve-seat grinding machine has been delivered to the Chrysler Corporation, Windsor, Ontario, by Hall-Toledo, Inc., Toledo, Ohio. This Model H-7600 machine incorporates the manufacturer's exclusive precision, eccentric-point

Hall six-spindle valve-seat grinding machine

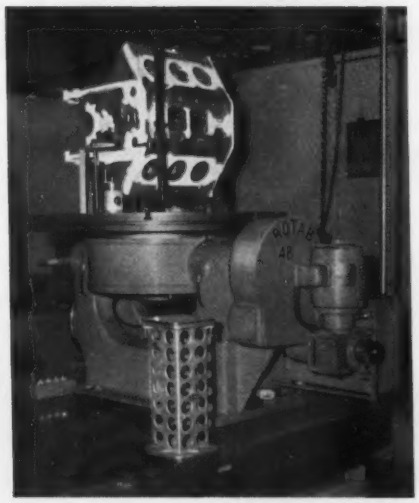




Dimensional check on 7 planes in one set-up!

up to 50% savings in time and manpower

Faceplates from 12" to 84" in diameter



Yes . . . every angle, diameter, straight line, every critical surface, on seven different planes of a V-type block, completely accurately checked without disturbing the initial set-up! How is it possible? With Machine Products' ROTAB universal rotary positioning table, that's how.

And consider the advantages. Previously, this same operation required two men, who had to "wrestle" the block into seven separate set-ups . . . each time re-establishing the locating point. With ROTAB the V-block is loaded on the horizontally positioned table, locating point determined, block clamped in place. Then, ROTAB's precision, movable graduated ring is set at zero to start the angular or radial check, and one man, using motor-powered, push button tilting and rotation runs the entire inspection, saving up to 50% in time, increasing accuracy, reducing rejects.

This, briefly, is what ROTAB has accomplished for one of the nation's leading diesel engine manufacturers.

ROTAB, with its unlimited applications, can do wonders for you, too.

Write today for your catalog!

MACHINE PRODUCTS *Corporation*

6771 E. McNICHOLS ROAD • DETROIT 12, MICHIGAN

For more data circle this page number on card at back of book

contact method of valve-seat grinding. It is of the wet type and in Chrysler's engine production line will grind six intake and six exhaust valve seats of their six cylinder engines. Accuracy is maintained within 0.002-inch total indicator reading. At 80 per cent efficiency, this machine will grind 540 valve seats per hour. Depth or width of valve seat is held consistent from one seat to the next, within 0.005 inch.

This fast, precision eccentric grinder is completely automated and is one of a series originated by Hall-Toledo, Inc. The block enters the machine from a conveyor. Six seats are ground simultaneously. Then a hydraulically powered index-table automatically rotates the block to a grinding position for the other six. The Model H-7600 incorporates three two-spindle gear-cases with eccentric-grinding floating spindles.

Also completely automated is the grinding-wheel dresser mechanism, which dresses the wheels at a predetermined frequency. The machine feed compensates for the removal of the material from the grinding wheels during each dressing operation.

Circle **685** on cards facing back cover

Oscillating-Arm Type Buffing Machine

A machine of the oscillating-arm type designed for automatically buffing or polishing a wide variety of parts which have obstructions that prevent complete rotation is now available from the Acme Mfg. Co., Detroit, Mich. This unit is especially adapted to the buffing of parts such as coffee pots with spouts or ratchet type wrench heads with handles that prevent complete rotation of the part in contact with the buffing wheel. Other types of parts with handles, large butt hinges, plumbing and boat hardware parts with one side obstructed, or stampings or die-castings with radius portions that require buffing can also be finished.

Basically, the machine consists of an Acme E-10 semi-automatic machine equipped with an air-cylinder advance and an oscillating-arm fixture. Parts can be mounted on an arbor with a locator and square drive. Then the arbor and part assembly are positioned in the oscillating-arm unit by an air-powered tailstock. Other special types of work-chucking arrangements can be provided to suit the specific part.

With the parts positioned in the arm, they are advanced by an air-cylinder control into contact with a buffing wheel mounted on a conventional double-end buffing lathe or an adjustable lathe. Then a push-button initiates a timed sequence of arm oscillation to give the desired wheel-contact time.

The oscillating-arm unit can be adjusted to give from zero to 360 degrees of oscillation and thus meets a variety of part-finishing requirements. Two machines like the one illustrated finish ratchet type wrench heads at a rate of 600 wrenches per hour with one operator. Fifteen wrenches are mounted on an arbor at one time and positioned radially by a locating strap. The Acme E-10 machine equipped with the oscillating arm and air-actuation devices occupies a floor space approximately 4 by 5 feet and is 4 1/2 feet high. The arm is powered with a 1/2-hp motor.

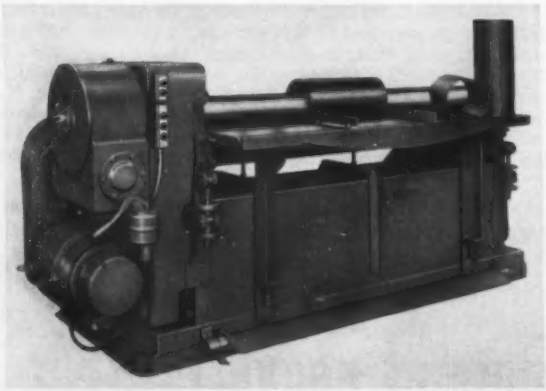
Circle **686** on cards facing back cover

Cylinder-Forming Bending Roll

Practically true cylinders can be formed in one pass on a bending roll recently developed by the Roll Department, Wysong & Miles Co., Greensboro, N. C. The flat spots characteristic of cylinders formed on conventional roll-forming equipment are reduced to fractions of an inch without preforming. This is accomplished by the use of an adjustable shoe and a specially grooved forming roll which cause the stock to start forming almost as soon as it passes through the feed-rolls. Close contact is maintained throughout the operation to practically eliminate any flat on the trailing edge.

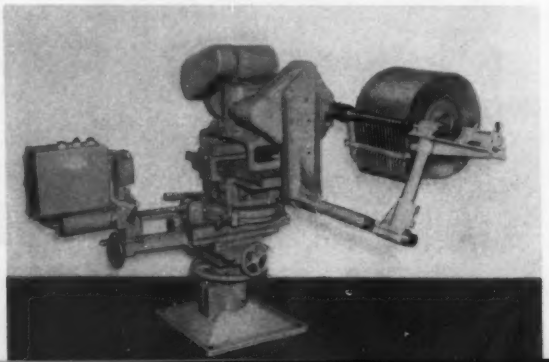
Standard equipment of this Model TC-672 machine includes motor and controls, an adjustable table with T-slots for guide arms, a safety disconnect foot treadle, and an air-operated drop-end. At extra cost this machine can be equipped to feed blanks and remove formed cylinders automatically. It has a working length of 6 feet. The diameter of the feed and forming rolls is 6 inches. Bending capacity is 12-gage mild steel.

Circle **687** on cards facing back cover

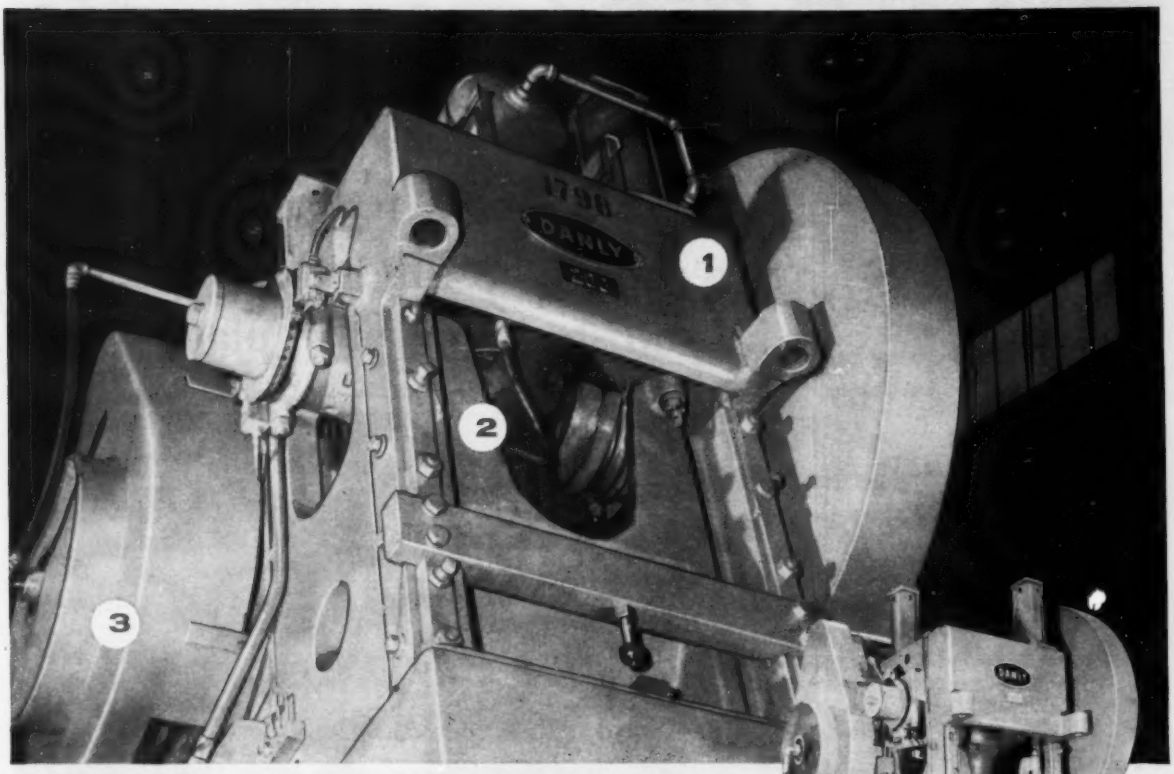


Wysong cylinder-forming bending roll

Acme oscillating-arm buffing machine



FROM ANY ANGLE



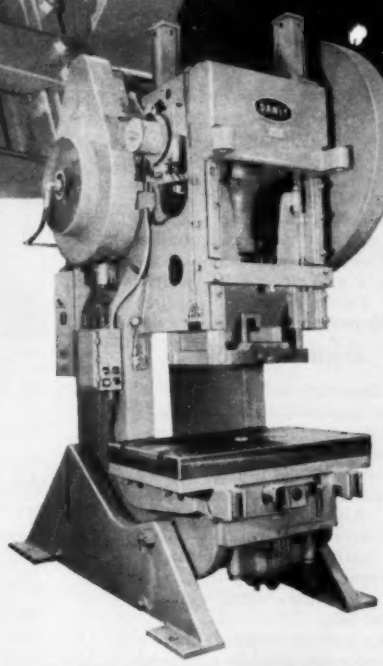
IT COSTS LESS TO RUN A DANLY O.B.I.

(1) **Compare a Danly welded-steel frame,** for example, with any comparable press available. A Danly frame is designed to the most rigid deflection standards, with extra brawn to resist shock and vibration. This means longer die life, less downtime for die maintenance, and more accurate stampings, too.

(2) **Compare the drive . . .** the forged and heat-treated crank shaft, the bronze-bushed bearings, the quiet gearing. Danly O.B.I.s are built to defy breakdowns . . . to give you bonus productive hours.

(3) **Compare the clutch . . .** the same patented air friction clutch that has made Danly presses standouts in major stamping plants around the world. Because of its low inertia design, and long-life floating friction inserts, your maintenance department can almost forget it's there.

Compare a Danly O.B.I. from *any* angle. You'll find it's built for lower cost, more dependable operation. Write for the new Danly O.B.I. Catalog and the detailed specifications will convince you.



MMT-PE

DANLY

DANLY

DANLY MACHINE SPECIALTIES, INC., 2100 SOUTH LARAMIE AVE., CHICAGO 50, ILLINOIS

For more data circle this page number on card at back of book

RBW FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By Fred E. Graves

Why cap screws instead of studs?

Many types of products once fastened with studs are today assembled with cap screws. Why the change in preference?

Studs show certain advantages in large diameters and in high temperature applications. But when it comes to smaller sizes used in tapped holes, designers and production people have found more advantages in cap screws.

ASSEMBLY FACTORS

In fastener selection for a given application, you have to consider production and assembly as well as joint strength.

Obviously, studs require two wrenchings (first stud, then nut). Also, there's a more expensive close tolerance tapping job, since a stud takes an interference fit to stay tight and not withdraw when nut is backed off.

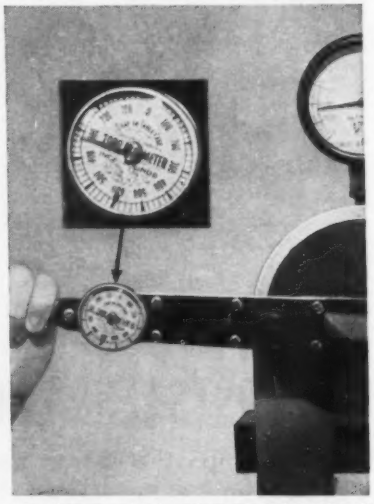
Cap screws require only a clearance fit. Used in a tapped casting, they can be repeatedly inserted and unscrewed without damage to threads.

HOW NOT TO USE STUDS

Studs are not meant to serve as dowels to locate and line up for fastening. To line up numerous studs and bring two pieces together raises assembly cost. Use dowel pins for alignment and use cap screws for fastening to achieve greater economy.

Screw develops high thread tension . . . and stays locked in place

RB&W TENSILOCK screw, despite the friction of the toothed flange, develops 4000 pounds tension with on-torque of 240 inch-pounds.



An off-torque of 330 inch-pounds fails to break loose the grip of the teeth. Tension is maintained by TENSILOCK screw.

Here is a locking fastener where the on-torque effort not only *anchors* the screw but also develops high preloading, or residual tension.

Like high tensile cap screws, RB&W's TENSILOCK* screws also give a high thread tension to torque ratio. But there's one important difference. The TENSILOCK fasteners lock with *teeth* as well as high residual tension.

RATCHET-LIKE LOCKING

Carburized teeth on flange of this one-piece fastener are so angled as to afford easy torquing. They bite into the seating surface when fastener is fully tightened. A circular groove in the flange increases flexing action and enables flange to maintain pressure on the imbedded teeth. To *loosen* a tightened TENSILOCK fastener thus takes much more effort than the on-torque. And it can be reused with little loss of this holding power.

FRICTION STOPS SLIPPAGE

The full clamping force exerted by these fasteners prevents slippage of the fastened members where lateral movement is possible because of large or eccentric holes. The positive gripping enables them to stay tight even under conditions of severe vibration or cyclic temperature fluctuations. RB&W TENSILOCK nuts also available. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

*Trademark Pat. applied for

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa., Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

NEW CATALOGUES

• Yours for the asking . . . use postcard inside back cover

Filter Coolant

Hydromation Filter Co., Detroit, Mich. Bulletin on "Hydro-Vac" filters, which automatically filter out contaminants from coolants by applying both pressure and vacuum to the filtering media. They are designed in five different sizes.

Circle **Item 501** on Inquiry Card

Chucking Machines

Hardinge Brothers, Inc., Elmira, N. Y. Bulletin HC-HCT, giving complete information on the company's precision chucking machines. Models HC-cfr and HCT-cfr are described. They turn, face, bore, and thread in one chucking and one handling.

Circle **Item 502** on Inquiry Card

Air-Gaging

Sheffield Corporation, Dayton, Ohio. Handbook on dimensional air-gaging, describing how to select the right amplification for the gaging job and telling when to use long-range air gages; also gives advantages of air-gaging inside and ouside diameters, etc.

Circle **Item 503** on Inquiry Card

Chipless Machining

Grob, Inc., Grafton, Wis. Catalogue describing special cold-splined rolling machines for chipless machining. The "Grob Roll" No. 10 has a 6- to 12-inch capacity with 8-foot bed. It produces strong, accurate, smooth gear and spline shapes.

Circle **Item 504** on Inquiry Card

Ram Benders

Wallace Supplies Mfg. Co., Chicago, Ill. Catalogue presenting ram benders for forming iron pipe and channels and bars of steel, copper, brass, stainless, and Monel. Size range of benders is for 1/2 inch O. D. tube to 16 inch O. D. pipe.

Circle **Item 505** on Inquiry Card

Power Tools

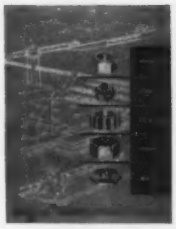
Skil Corporation, Chicago, Ill. Catalogue describing the company's line of power tools and accessories. Applications include plant maintenance, industrial production, construction, metalworking, automotive service, and others.

Circle **Item 506** on Inquiry Card

Diamond Data

Industrial Diamond Division, Engelhard Industries, Inc., Newark, N. J. First issue of *Diamond Data,* a new technical periodical of this division. To be issued monthly, the new publication is designed to be of interest and practical value to all.

Circle **Item 507** on Inquiry Card



Hexagon-Nut Specifications

National Machine Products Co., Utica, Mich. Condensation of the company's 140-page catalogue, containing all basic engineering data and specifications on hexagon nuts in sizes ¼ inch to 3 inches; 12 pointer nuts in sizes 1/4 to 5/8 inch; etc.

Circle **Item 508** on Inquiry Card

Tool-Holders for Carbide Inserts

Wesson Co., Detroit, Mich. Bulletin T-160, describing three lines of holders for use with carbide inserts. Featured are the new standard Wesson T-A holders for square and triangular throw-away inserts and a family of "Multicut" tracer-turning holders.

Circle **Item 509** on Inquiry Card

Surface-Finish Measurement

Micrometrical Mfg. Co., Ann Arbor, Mich. Bulletin describing the practical features and applications of the "Profilometer." Illustrations show a variety of Profilometer combinations for measuring surface finish of most production surfaces.

Circle **Item 510** on Inquiry Card

Gear Motors

Sterling Electric Motors, Inc., Los Angeles, Calif. Bulletin No. 198, on the company's "Slo-Speed" gear motors and separate motor reducers. It describes the features of the Slo-Speed design, the basic types and many modifications, etc.

Circle **Item 511** on Inquiry Card

Flash-Butt Welders

Taylor-Winfield Corporation, Warren, Ohio. Bulletin 7-913 describing the resistance flash-butt welding process and illustrating types of clamping, flash, and upset mechanisms. Designed for specific applications, forty butt-welders are shown.

Circle **Item 512** on Inquiry Card

• Yours for the asking . . . use postcard inside back cover

Bearings

Thomson Industries, Inc., Manhasset, N. Y. Bulletin describing a line of "Nylined" bearings and giving applications. They are made of nylon plastic which is not only extremely smooth, tough, and resilient but has heat and mechanical resistance.

Circle **Item 513** on Inquiry Card

Varied Machine Tools

Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Condensed catalogue No. 60 describing horizontal boring, drilling, and milling machines; vertical turret lathes; vertical boring mills; upright and radial drilling machines; planer mills; etc.

Circle **Item 519** on Inquiry Card

Miniature Bearings

New Hampshire Ball Bearings, Inc., Peterborough, N. H. 140-page "Design and Purchasing Manual" on miniature and instrument ball bearings. Complete specifications on 370 standard New Hampshire bearings from 1/10 to 5/8 inch O. D. are included.

Circle **Item 514** on Inquiry Card

Tool and Cutter Grinders

Hartex Division (West Germany), Union Twist Drill Co., Athol, Mass. Brochure describing a line of tool and cutter grinders. No. 1 is a cutter and reamer grinder; No. 2, a formed cutter grinder; and Nos. 3 and 5, tangent-arc profile grinders.

Circle **Item 520** on Inquiry Card

Machining Steels

Joseph T. Ryerson & Son, Inc., Chicago, Ill. Bulletin 12-10, giving engineering data on Ledloy 375 and 300 cold-finished steel bars, and Ledloy 170 cold-drawn steel tubing, said to be the fastest machining bar and tubular steels available.

Circle **Item 515** on Inquiry Card

Assembling Press

Denison Engineering Division, American Brake Shoe Co., Columbus, Ohio. Bulletin No. 120, describing the versatility of the Denison "Multipress," with special emphasis on new models. It is illustrated with actual case-history pictures.

Circle **Item 521** on Inquiry Card

Swivel Table Adjustment

Landis Tool Co., Waynesboro, Pa. Bulletin M-60, describing the company's mechanical "Micro-Swivel" for sensitive swivel table adjustments on Landis cylindrical grinders. Micro-Swivel is a low-cost device for accurate swivel table corrections.

Circle **Item 516** on Inquiry Card

Lubrication Systems

Farval Division, Eaton Mfg. Co., Cleveland, Ohio. Revised general brochure, No. 26-T, containing information on a complete line of centralized systems of lubrication. Advantages of these systems and principles of operation are discussed.

Circle **Item 522** on Inquiry Card

Lubricating Device

Lubriquipment Engineers, Fort Worth, Texas. Catalogue sheet on "Lubrimatic" grease cups, which can replace existing grease fittings, grease cups, and other lubricating devices. They protect bearing seals by means of valve seats in their housings.

Circle **Item 517** on Inquiry Card

Coatings

Bee Chemical Co., Logo Division, Chicago, Ill. 45-page booklet on "Coatings for Vacuum Metallizing," describing in detail the application and use of vacuum metallizing coatings which may be applied by spraying, dipping, and flow coating.

Circle **Item 523** on Inquiry Card

Optical and Instrument Benches

Gaertner Scientific Corporation, Chicago, Ill. Bulletin No. 156-59, describing a line of optical and instrument benches. The company designs and manufactures precision optical and measuring instruments for a wide variety of applications.

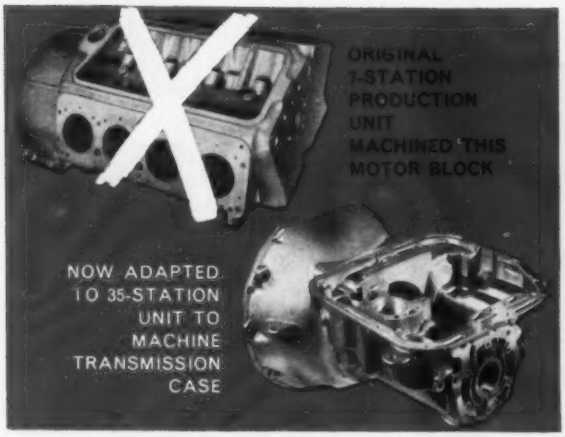
Circle **Item 518** on Inquiry Card

Speed Reduction

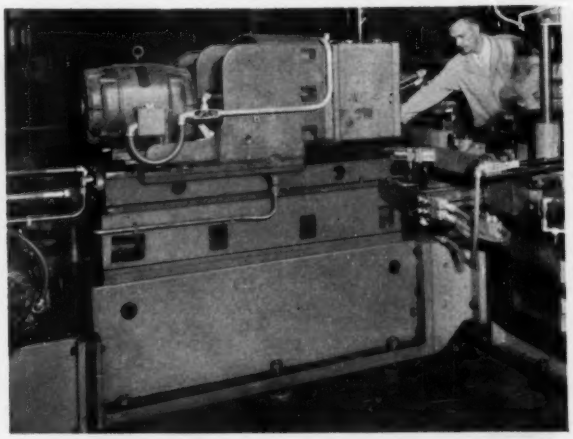
Dodge Mfg. Corporation, Mishawaka, Ind. Bulletin A692, describing modern methods of speed reduction with compact, shaft-mounted units in a wide range of sizes and horsepowers. An expanded line of "Torque-Arm" speed reducers is also presented.

Circle **Item 524** on Inquiry Card

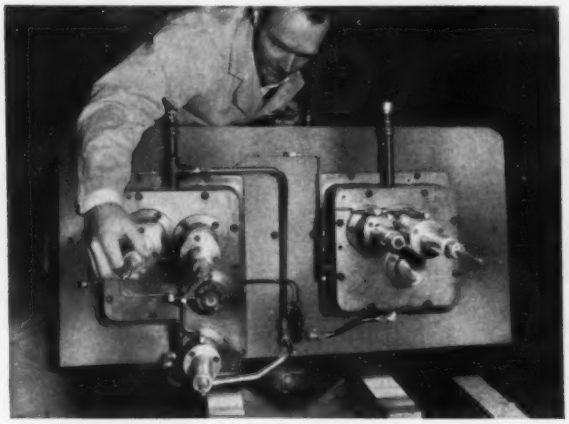
HOW BARNESDRIL PRODUCTION UNITS SAVE MONEY THROUGH FLEXIBILITY!


ORIGINAL 7-STATION PRODUCTION UNIT MACHINED THIS MOTOR BLOCK
NOW ADAPTED TO 35-STATION UNIT TO MACHINE TRANSMISSION CASE

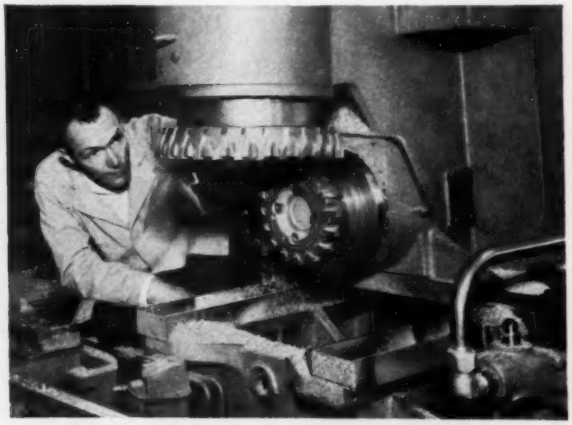
BarnesdriL units regroup easily . . . economically. A leading automobile manufacturer, for instance, is reducing the costs of tooling for a new transmission case by using BarnesdriL units from an obsolete motor block line built to the "Building Block" principle. "Before and after" parts are illustrated.



This "obsolete" unit will go right on producing! That's because BarnesdriL unit and slide assemblies are separate. Base and column sections are separate, too, for widest possible flexibility. Units have inserted hardened and ground steel ways, with saddle type construction to reduce height of auxiliary heads.



By simply replacing the "pot" this unit can be adapted to major styling changes. All "pot type" heads are used on this line. Pallets used to hold the work fixtures also can be re-used when the machine is rebuilt. Since pallets rise very little from the rest pad for indexing, they automatically sweep chips into the flume.



This duplex milling head is combined with drilling, tapping, reaming, boring, and facing units on the new 35 station machine. Gross production rate is one case every 36 seconds. For easy maintenance, hydraulic cylinders on BarnesdriL units can be removed by loosening 4 bolts and uncoupling the tie rod.

Get the complete story in cost-cutting BarnesdriL Production Units . . . write for catalog 150-D Today!

BARNESDRIL
PRODUCTION UNITS

Honing Machines / Production Units / Filtration Units / Drilling Machines

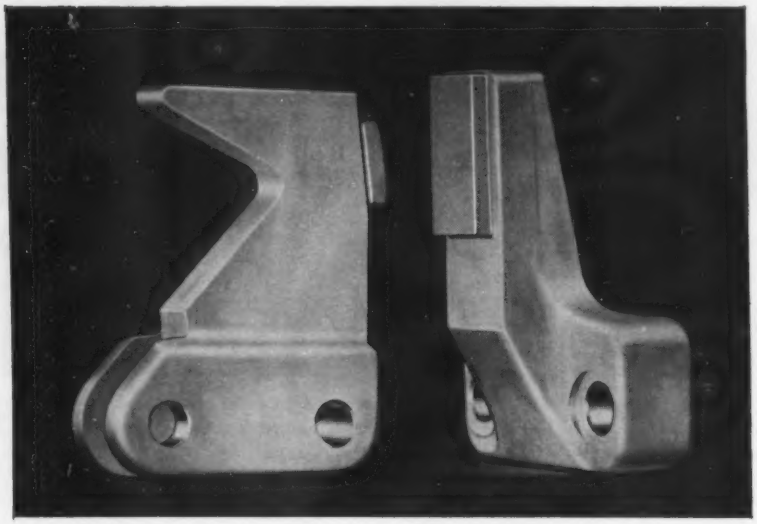
BARNES DRILL CO.

820 Chestnut Street • Rockford, Illinois
DETROIT OFFICE — 13121 Puritan Avenue

For more data circle this page number on card at back of book

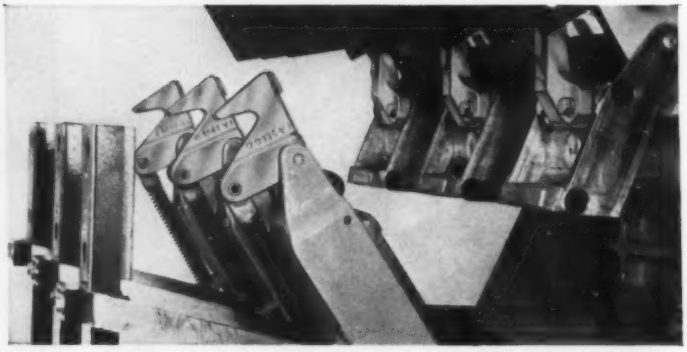
TWICE-WROUGHT METAL

of die-pressed forgings helps Federal Pacific make new air circuit breakers more rugged—cuts machining costs in half

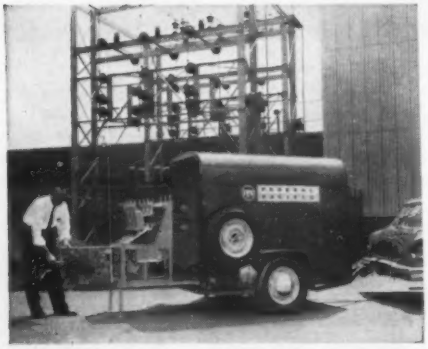


In its new Type DST magnetic air circuit breaker line, Federal Pacific Electric Company, Newark, N. J., builds in dependable operation and long life with parts of outstanding mechanical and adequate electrical properties.

Typical of this attention to detail are the arcing contacts (left). Similar parts previously used had been castings or built-up assemblies. Now the contact bodies are Anaconda Forging Brass-250 die-pressed forgings. The twice-wrought metal is denser, stronger, withstands mechanical shock better—reducing the fatigue factor and producing longer service life. The contacts also have higher conductivity. And best of all, their consistent dimensional accuracy and smooth finish cut machining costs in half.



RIGHT: Movable arcing contact assemblies at the left and the stationary arcing contact assemblies at the right in a 5-kv Federal Pacific Type DST air circuit breaker. They have a momentary current-carrying capacity of 60,000 amperes. Contact tips of tungsten alloy are silver-soldered to the forgings. These are two of several areas where Federal Pacific uses the superior physical properties of Anaconda die-pressed forgings to help provide dependable operation and long service life in its line of metal-clad switchgear.



Federal Pacific takes its circuit breakers out to industrial and electric utility customers. Here a representative sets up a demonstration of a 5-kv, 1,200-amp breaker in the field.

IT IS often easier than you think to achieve high quality and performance while simplifying fabrication and cutting over-all costs. American Brass technical specialists are constantly working with designers, production engineers and buyers, helping them meet their joint requirements—through the use of such Anaconda mill products as die-pressed forgings, extruded shapes, special-shape tubes. For this kind of practical help, see your American Brass representative or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Toronto 14, Ontario. 5944

ANACONDA®

COPPER • BRASS • BRONZE
NICKEL SILVER • MILL PRODUCTS

Made by The American Brass Company

• Yours for the asking . . . use postcard inside back cover

Special Tooling

Tool Products Corporation, North Tonawanda, N. Y. Catalogue No. U-95, describing the corporation's Series "HD" (heavy-duty) unitized tooling for the metal-fabricating industry. The line features built-in lubrication and other improvements.

Circle **Item 525** on Inquiry Card

Tap Selector

The Hanson-Whitney Co., Hartford, Conn. Catalogue presenting correct taps for all purposes, regardless of type of material, which can now be ordered by catalogue number with the new "Tap Selector." It also includes a section on price and gage information.

Circle **Item 526** on Inquiry Card

Tapping and Drilling

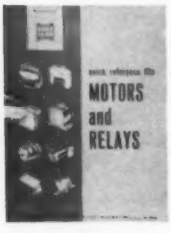
Beckett-Harcum Co., Wilmington, Ohio. Catalogue No. F-60 giving specifications on its drill-press feeds and tapping and drilling machines. Drill-press feeds consist of standard-duty, heavy-duty, and gear-head air-powered feeds.

Circle **Item 527** on Inquiry Card

Motors

B & B Electric Motor Co., New York City. Catalogue listing hundreds of geared and nongeared electric motors from 1/2000 to 25 hp. Most of these motors are used by design and project engineers for their research and development programs.

Circle **Item 528** on Inquiry Card



Motors and Relays

Barber-Colman Co., Rockford, Ill. Folder giving typical specifications on complete line of the company's a-c and d-c fractional-horsepower motors, tachometer generators, and ultra sensitive relays. Listed are rated horsepower, dimensions, etc.

Circle **Item 529** on Inquiry Card

Squareness Testing

Indi-Square Co., Rochester, N. Y. Folder describing the "Indi-Square," which eliminates time-consuming effort and uncertainty of inspection and setup for squareness. It is useful for tool inspection and toolroom setup, parts inspection, etc.

Circle **Item 530** on Inquiry Card

Straight-Thread Ports

Hannifin Co., Des Plaines, Ill. Bulletin supplement S-113-1A covering the benefits derived from the use of straight-thread cylinder ports, with a table for determining straight-thread port sizes for 1 1/2- through 8-inch-bore cylinders.

Circle **Item 531** on Inquiry Card

Shafts, Rolls, and Guide Rods

Thomson Industries, Inc., Manhasset, N. Y. Bulletin presenting a line of hardened and ground shafts, rolls, and guide rods and other long-round parts. They are characterized by wear resistance, increased machine life, and accurate diameters.

Circle **Item 532** on Inquiry Card

Gear Grinder

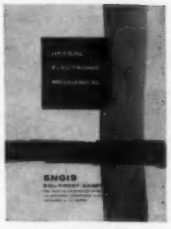
Michigan Tool Co., Detroit, Mich. Bulletin No. DCG-1, covering a deburring and chamfering grinder for spur, helical, and bevel gears. The machine simultaneously deburrs and chamfers the entire contour of both ends of the teeth of gears.

Circle **Item 533** on Inquiry Card

Steel Bearings

La Salle Steel Co., Chicago, Ill. Bulletin No. 10, on a line of "Fatigue-Proof" steel bars which combine high strength, free machining, uniformity, fatigue resistance, wear resistance, and dimensional stability. They have accuracy and smooth finish.

Circle **Item 534** on Inquiry Card



Optical Tooling

Engis Equipment Co., Chicago, Ill. Catalogue featuring optical, electronic, and mechanical tools, gages, and instruments. Microptic auto-collimators and a variety of special telescopes and optical accessories are described and illustrated.

Circle **Item 535** on Inquiry Card

Precision Tools

L. S. Starrett Co., Athol, Mass. Catalogue describing eighty-eight new tools, including new satin-chrome steel tapes; master vernier height gages and calipers; many new micrometer calipers, inside micrometers, micrometer depth gages, etc.

Circle **Item 536** on Inquiry Card

• Yours for the asking . . . use postcard inside back cover

Chains and Sprockets

Link-Belt Co., Chicago, Ill. Book No. 2757, presenting stock sizes of roller chains and sprockets. It lists over 2000 types and sizes of stock roller chains and sprockets, including standard and double pitch power-transmission chains, etc.

Circle **Item 537** on Inquiry Card

Comparators

Mueller Gages Co., Pasadena, Calif. Folder describing the new "Mikrom" comparator. Carbide measuring balls, backstops, lifting levers, threaded columns for fast adjustment, and fine and extra-fine zero adjustments are all standard equipment.

Circle **Item 543** on Inquiry Card

Automatic Feeders

Detroit Power Screwdriver Co., Detroit, Mich. Folder No. 2812, on a line of elevating feeders for automatic feeding and orienting of parts. Parts manufactured from most materials in almost any shape can be handled quickly and gently.

Circle **Item 538** on Inquiry Card

Punch and Die-Button Retainers

Special Products Division, Atlantic Tool & Die Co., Cleveland, Ohio. Bulletin illustrating retainers, punches, and die buttons. These special retainers are of the "ball-lock" type, made of oil-hardening tool steel of standard thickness.

Circle **Item 544** on Inquiry Card

Permanent Magnet Pulleys

Stearns Magnetic Products, Milwaukee, Wis. Bulletin No. 1022 on the extension of their line of "Indox V" permanent magnet pulleys to include sizes from 12 to 48 inches in diameter. Indox V pulleys have been used for tramp iron removal, separation, etc.

Circle **Item 539** on Inquiry Card

Multiple Spindle Heads

Jarvis Corporation, Middletown, Conn. Brochure describing the company's latest addition to its line of multiple drilling and tapping heads. It fully illustrates the advantages of a new type of universal joint multiple head: flexibility coupled with rigidity.

Circle **Item 545** on Inquiry Card

Bearings Units

Browning Mfg. Co., Maysville, Ky. Catalogue Bu-103-A on a line of bearing units: pillow blocks with sealed bearings in low and high heights, four-hole flange units with sealed bearings to 2 7/16 inches, pillow blocks with Re-Lube bearings, etc.

Circle **Item 540** on Inquiry Card

Tube Fittings

Imperial Brass Mfg. Co., Chicago, Ill. Catalogue No. 3108, containing technical data on the complete "Hi-Seal" butt-joint fitting line. It contains over 250 additional styles and sizes, and includes material on "Braze-Seal" fittings.

Circle **Item 546** on Inquiry Card

Special Quills

Bryant Chucking Grinder Co., Springfield, Vt. Catalogue listing quills available for Bryant grinding spindles. Detailed instructions for ordering the proper quill for each spindle and information on wheel binder screws and special wrenches are included.

Circle **Item 541** on Inquiry Card

Ball Bearings

Hoover Ball & Bearing Co., Ann Arbor, Mich. Bulletin 112, describing Series R and 30, inch and metric dimension ball bearings made by the company. R series are available in three variations. 30 series are available in five variations.

Circle **Item 547** on Inquiry Card

Drill Grinder

Union Twist Drill Co., Athol, Mass. Brochure describing a "multi-point" drill grinder designed to perform rapidly the following operations: grinding of 118-degree points, grinding of 135-degree points, grinding (crankshaft) of split points, web thinning, etc.

Circle **Item 542** on Inquiry Card

Thread Gaging

Johnson Gage Co., Bloomfield, Conn. Catalogue featuring its complete line of ring-snap, roll-snap comparators. In addition to the complete Johnson line, much essential technical information, including recommended gaging procedures, is given.

Circle **Item 548** on Inquiry Card

catalogues . . . . bulletins . . . . manuals

• Yours for the asking . . . use postcard inside back cover

Hydraulic Tester

Schroeder Brothers Corporation, McKees Rocks, Pa. Bulletin describing means and methods for using a portable hydraulic circuit tester. It outlines maintenance methods that should be followed when trouble-shooting hydraulic systems, etc.

Circle **Item 549** on Inquiry Card

Electric Controls

Warner Electric Brake & Clutch Co., Beloit, Wis. Brochure Form P-75, describing the company's standard, special, and custom controls used to actuate Warner electric brakes and clutches. Included are sections on description, operation, etc.

Circle **Item 550** on Inquiry Card

Die-Head Chasers

Landis Machine Co., Waynesboro, Pa. Bulletin A-50-5 on tangential die-head chasers. Tangential design provides line contact with the work for natural clearance comparable to that of a lathe tool. Friction at cutting edge is greatly reduced.

Circle **Item 551** on Inquiry Card

Coil Handling

Durant Tool Co., Providence, R. I. Revised catalogue, fully illustrated and detailed, featuring dimensions, capacities, specifications, and prices on eight Durant automatic and motor-driven stock reels for all coil-handling applications.

Circle **Item 552** on Inquiry Card

Laminate

Clad Rex Corporation, a subsidiary of Simoniz Co., Chicago, Ill. Catalogue presenting a vinyl-metal laminate with applications in the automotive field. It has "superior abrasion resistance and maximum resistance to chemicals," and it is protection against corrosion.

Circle **Item 553** on Inquiry Card

Pendent Switches

Joy Mfg. Co., Electrical Products Division, St. Louis, Mo. Bulletin on nine pendent switches for electric-hoist control. Safety and minimum maintenance are the principal features of these switches, which are encased in "Hycar" synthetic rubber.

Circle **Item 554** on Inquiry Card

Cap-Screws

Holo-Krome Screw Corporation, Hartford, Conn. Form CSN, covering the new 1960 series socket-head cap-screws. The format is designed especially for engineers. It can be readily reproduced on conventional blueprint machines.

Circle **Item 555** on Inquiry Card

Fasteners

Huck Mfg. Co., Detroit, Mich. Catalogue on a complete line of fasteners, including a discussion of a broad variety of tension and featherweight "Huckbolt" fasteners, self-broaching Huckbolt fasteners, self-sizing Huckbolt fasteners, etc.

Circle **Item 556** on Inquiry Card

General Catalogue

Barnes Drill Co., Rockford, Ill. Bulletin GC-60, outlining the complete line of the company's equipment, including transfer machines and coolant cleaning equipment. Illustrations include applications and parts, and data includes machine capacities.

Circle **Item 557** on Inquiry Card

Speed Systems

U. S. Electrical Motors Inc., Los Angeles, Calif. Brochure describing the U. S. Varidyne a-c controlled speed systems, illustrated with schematic drawings as well as application photographs. Varidyne uses alternating-current characteristics.

Circle **Item 558** on Inquiry Card

General-Purpose Motors

General Electric Co., Schenectady, N. Y. Catalogue GEA-6424A, discussing features of a line of fractional-horsepower Form G general-purpose motors. Capacitor-start, split-phase, shaded-pole, and polyphase motors are included.

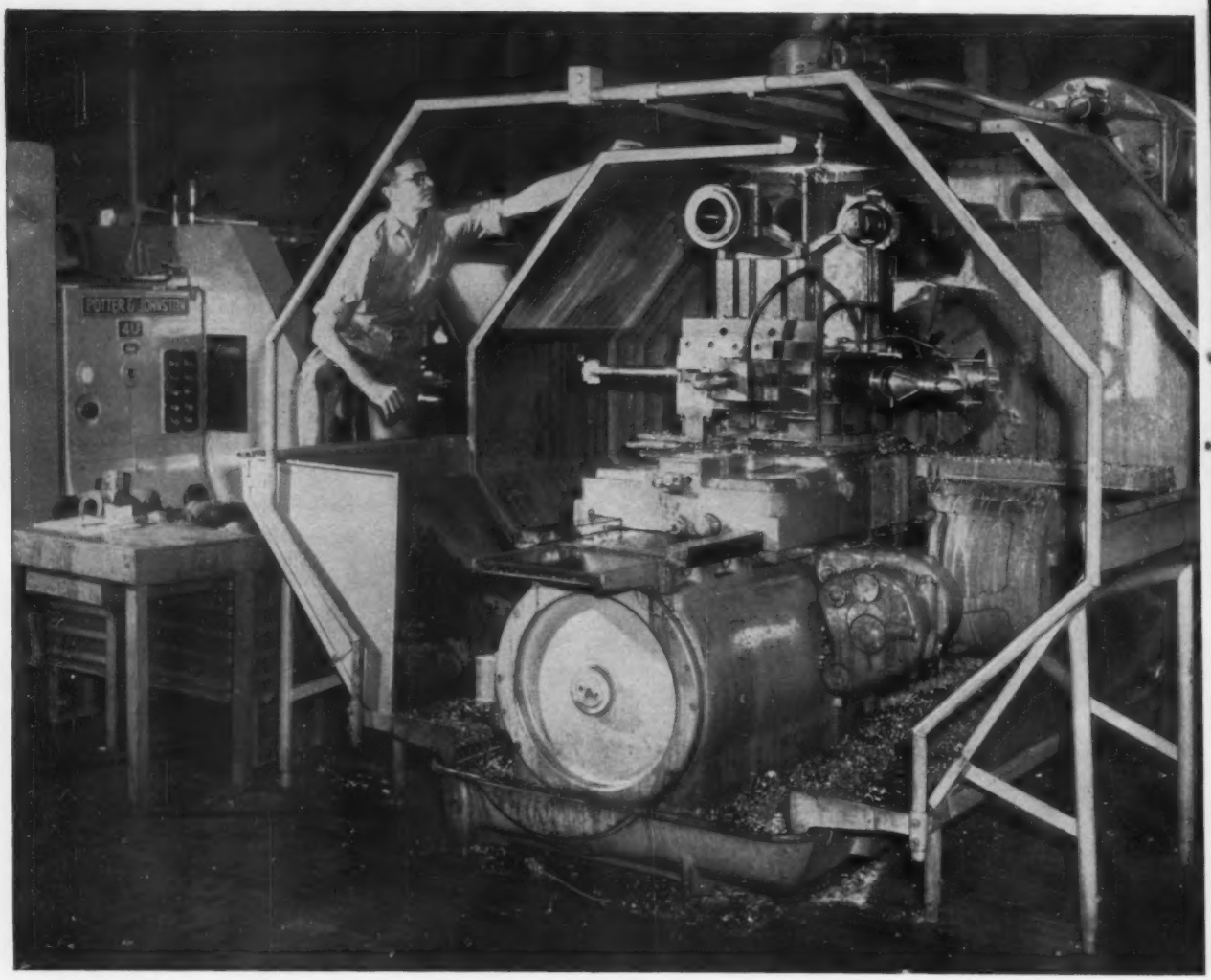
Circle **Item 559** on Inquiry Card

Spindles

Pope Machinery Corporation, Haverhill, Mass. Bulletin S-18, describing over sixty types of precision spindles for grinding, boring, milling, etc., including high-frequency spindles and "Anocut" spindles arranged for electrolytic grinding.

Circle **Item 560** on Inquiry Card

"Valve Bodies machined



JOB FACTS

THE PART: Plug Valve Body

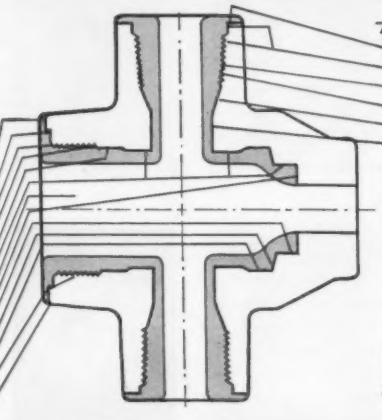
MATERIAL: 4140 Steel Casting, 287-301 Bhn

REQUIRED: A total of 33 roughing and finishing cuts, involving very heavy metal removal.

THE MACHINES: A Potter & Johnston 6DREL-40 and a Potter & Johnston 4-U.

FIRST OPERATION

FACE
FACE
CHAMFER
FORM CONTOUR
COUNTERBORE
STEPPED CORE DRILL
PILOT BORE FOR DRILL
FACE, Single Point Cut
BORE
FACE BOTTOM
FORM CONTOURS, Single Point Cuts
STRAIGHT THREAD
CHAMFER



SECOND OPERATION

FACE, Single Point Cuts
STEPPED CORE DRILL
FORM TAPER, Single Point Cut
TAPER THREAD
FORM CONTOUR, Single Point Cut
CORE DRILL

THIRD OPERATION

(Index and repeat operation on opposite end.)

THE RESULTS

A part completed every 6½ minutes - a time saving of 80% over previous methods. The first operation is performed on one machine. While this is working, the other machine is loaded, and the second and third operations are completed.

SHADED AREAS INDICATE METAL REMOVED

in One-Fifth the time

...plus attractive savings in set-up time!"

Two Potter & Johnston Automatic Turret Lathes . . . a Model 4-U and a Model 6DREL-40 recently installed in the Mission Manufacturing Company's plant at Houston, Texas . . . are now producing plug valve bodies in 20% to 50% of the time previously required using hand turret lathes. Widely used in oil field and chemical industry applications, these valve bodies are machined from heavy steel castings. The multiple machining operations require very heavy metal removal, demand close tolerances and, in addition, involve the generating of complex internal contours. Looking for a means of speeding up these machining operations, Mission investigated Potter & Johnston and other makes of machines. P&J Automatics were finally selected, because they are sturdier and heavier and because of the extreme savings in the set-up time for the various jobs. Other factors influencing Mission's choice include the accuracy of the P&J Machines, the savings in floor space made possible by their high output-per-area, and the fact that their completely automatic operation insures greatly increased production per man-machine hour.

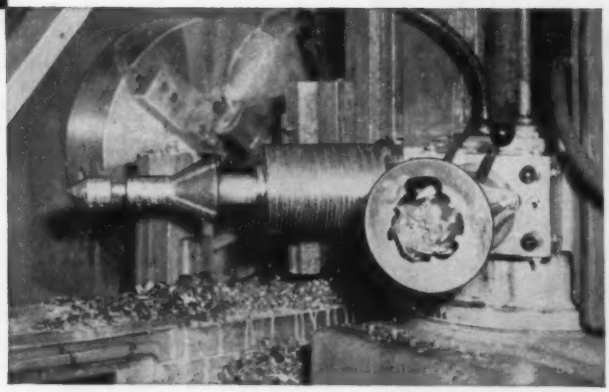
Combining extra power and rigidity for fast metal removal with the versatility needed to handle complex multiple cuts with speed and efficiency, Potter & Johnston Automatics can increase productivity and cut costs at your plant the same way they have at the Mission Manufacturing Company. For the dollars-and-cents facts, ask for production estimates on your jobs. Call the Pratt & Whitney Branch Office in your area or write direct, outlining your production needs.

PRATT & WHITNEY COMPANY, INC.,
12 Charter Oak Boulevard, West Hartford, Conn.

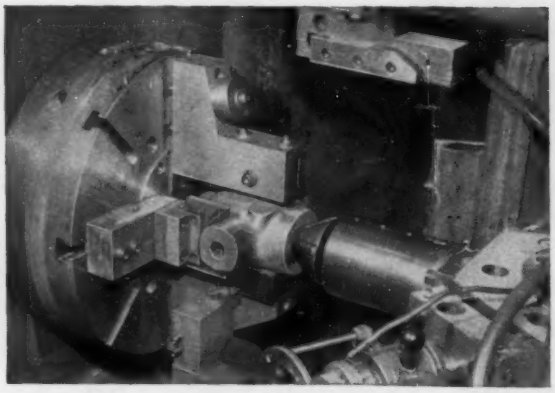
POTTER & JOHNSTON AUTOMATICS
MANUFACTURED BY

100th Anniversary 1860 1960

PRATT & WHITNEY®
FIRST CHOICE FOR ACCURACY
MACHINE TOOLS • GAGES • CUTTING TOOLS

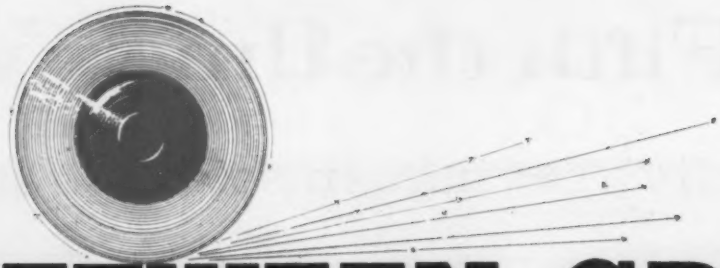


Heavy metal removed fast . . . contributes to the important time savings realized on this job. Heavy cuts like this require unusually powerful, rigid machines, like the P&J 6DREL-40 and 4-U.



Important savings in set-up time . . . are realized because this tooling, designed by P&J Specialists working with the manufacturer, incorporates an unusual degree of versatility and adaptability.

For more data circle this page number on card at back of book



E. S. Salichs

BETWEEN GRINDS

"Fodder" on Their Tombstones?

The Laclede Steel Corporation has a cemetery for iron horses, according to *Steelways*, which says that iron horses provide excellent fodder for open-hearth furnaces because they are low in undesirable elements. More than 400 of them have gone to Horse Heaven, the latest having once been the pride of the Norfolk & Western Railway Co. It weighed nearly 270 tons, was only thirty-five years old, but could no longer compete with the more economical diesels. Chug-chug.

Dean is the Doctor

"Sputnik fever," according to Dean Dale R. Corson of the Cornell University College of Engineering, hit the country two years ago and drove many potential engineers to study science instead of engineering. The fever is still raging and will weaken industry if not curbed. Cornell, however, is supplying the medication—special courses through its engineering physics department and the offer of alternative paths within a given curriculum.

Topp Tune

A hi-fi recording entitled "Voice of Automation" was sent to us from Topp Industries, Inc. We played the disc on our machine at home, and were treated to various noises of industry, then those sounds identified with Micro-Path, a control system marketed by the company, consisting of squeaks indicating right, left, forward, back, up, and down. So it didn't send the family; 'twas music to *our* ears.

Small Talk

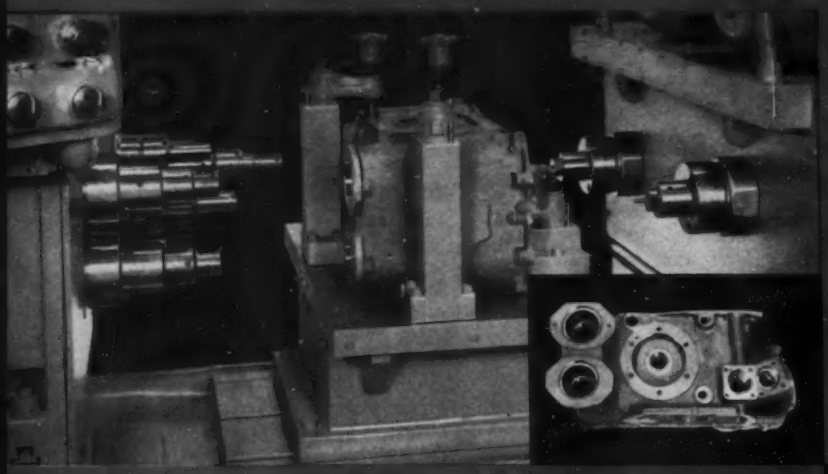
Miniaturesque (a tiny folder issued by Miniature Precision Bearings, Inc.) informs us that the company has been producing just one type of bearing for forty years—miniature—that only 0.02 ounce of metal may go into an MPB bearing, and that 15,000,000 of them have been made during these years.

Pesos through Pipes

A 16-inch aluminum underwater pipeline, believed to be the largest ever made of this light metal, is being installed for an oil company in Lake Maracaibo, Venezuela. Reynolds Metals Co. supplied the aluminum for the 1800-foot line. Aluminum was chosen because its corrosion resistance would permit installation in the lake without protective coating or wrapping.

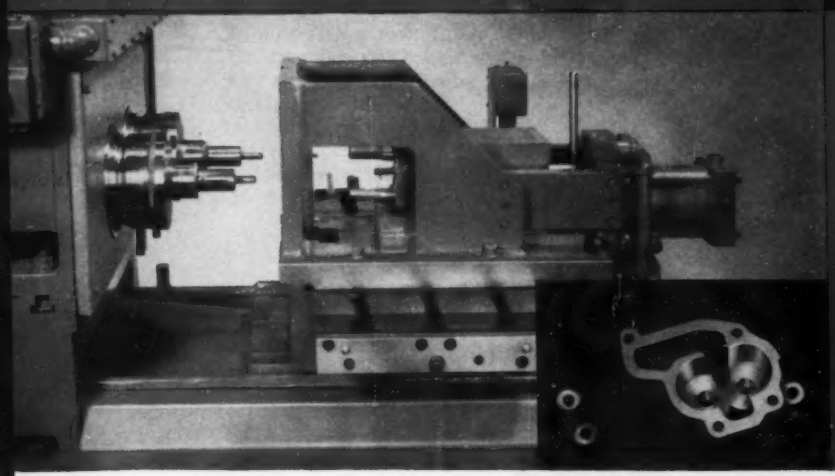
BANZAI, COSA—The one Japanese word in our vocabulary comes in handy momentarily; banzai, we understand, means felicitations, and that is what we are extending to Mr. Julius Mueller, president of the Cosa Export Co., Inc. (which exports American machine tools to the Orient). Mr. Mueller, who lived in Japan for twenty-five years, recently sponsored a Japanese opera (the composer of which is seen here with the cast) in an effort to foster better liaison and understanding between occidental and oriental students of music and arts. The proceeds went toward a new scholarship fund for Japanese students at the Manhattan School of Music. The audience included many executives of the machine tool industry, sixteen or more companies being represented.

Standard Ex-Cell-O Precision Boring Machines



. . . FOR FASTER MULTIPLE-HOLE WORK

Standard style 17-A performs 26 operations in one cycle on a magnesium aircraft casting. Machine bores five bronze bushings, counterbores seven diameters, faces four surfaces and chamfers eight shoulders with five spindles at left, two spindles at right.



. . . FOR FASTER CLOSE-TOLERANCE WORK

Style 112-D finish-bores gear pockets and shaft holes, and plunge-faces pocket bottoms of oil pump bodies to tolerance of plus or minus .0005". Flat faces are square to the bores and parallel to each other within working limits of .001".

59-17

10 REASONS WHY EX-CELL-O PRECISION BORING MACHINES DO MORE, AT LESS COST!

1. **RUGGED**—Heavily-ribbed base castings, chatter-free hydraulic-actuated table movement, isolated power assembly.
2. **FLEXIBLE**—Bridges easily spaced-out for large work, moved in for smaller parts.
3. **VERSATILE**—Inbuilt versatility, plus Universal Fixtures for toolroom work, short-run and production jobs. Spindles mount in any position.
4. **FAST**—Rapid table traverse, positive spindle brakes and quick-load fixtures for high output.
5. **LOW TOOLING COST**—Standard machine components, tools and accessories cut lead time, speed setup.
6. **AUTOMATIC LUBRICATION**—Separate lubricating system pumps oil directly to the ways.
7. **SEALED SPINDLES**—Ex-Cell-O Precision Spindles permanently lubricated during assembly.
8. **CONVENIENT CONTROLS**—Easy to use hydraulic controls contained in a single panel.
9. **TROUBLE-FREE**—Vital machine parts and controls protected from dirt, chips, coolant. Ready access to components for inspection.
10. **CAMS FOR CONTOURING**—Cam-operated boring machines available for precision contouring work.

Call your local Ex-Cell-O Representative, or write direct for complete details on the full line of Ex-Cell-O Precision Boring Machines.

EX-CELL-O FOR PRECISION

XLO

MMT-PE

EX-CELL-O CORPORATION Machinery Division

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • THREAD AND GROOVE GAGES • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

For more data circle this page number on card at back of book

News OF THE INDUSTRY

California

ARCOS CORPORATION, Philadelphia, Pa., has moved from 123 S. Santa Fe Ave., Los Angeles, to a new warehouse-sales office building at 6222 Chalet Drive, Bell Gardens, Los Angeles, Calif. The office will be staffed by CHARLES L. GODWARD, district manager; NORMAN S. SMITH, salesman for the area; and JOHN J. GORGAS.

DR. ARNOLD M. SMALL has been appointed manager of the product effectiveness laboratory of the Ground Systems Group, Hughes Aircraft Co., Culver City, Calif. Dr. Small formerly was manager of the Hughes-Fullerton reliability and quality assurance laboratory.

LAKE ERIE MACHINERY CORPORATION, Buffalo, N. Y., has appointed ROBERT A. MACLEAN western district manager, with headquarters in Los Angeles. He will have his offices at 22942 Burton St., Canoga Park.

MATTHEWS CORPORATION, Hawthorne, Calif., has named WALTER

Walter H. Girdler, Jr., chairman of the board, Matthews Corporation

H. GIRDLER, JR., chairman of the board and chief executive officer, under a reorganization and expansion program. RAYMOND A. MATTHEWS continues as president of the metalworking firm, while the new directorship is comprised of NOAH DIETRICH, EMMETT STEELE, FRANK NICHOL, GEORGE E. JOHNSON, RICHARD WOIKE, MR. GIRDLER, and MR. MATTHEWS.

W. J. WILEY has been appointed manager, missile manufacturing, at AEROJET-GENERAL CORPORATION'S plant in Downey, Calif. He was

W. J. Wiley, manager, missile manufacturing, Downey plant, Aerojet-General Corporation

formerly manager of production programming and control at Aerojet-Downey and has been closely associated with the Polaris, Minuteman, and other missile hardware programs in production at the plant.

W. P. WOODS has been named chief tool engineer for the Convair (San Diego) Division of General Dynamics Corporation. He succeeds A. E. HILL, who has joined the staff of August C. Esenwein, Convair executive vice-president.

AIR REDUCTION PACIFIC CO., a division of Air Reduction Co., Inc., has opened a new liquid air separation plant in Richmond, Calif.

Washington, D.C., & Florida

ELECTRC PRODUCTS DIVISION, Vickers Incorporated, St. Louis, Mo., announces that JOHN F. KRAMER has been transferred from the division's Cleveland office to the firm's Washington, D. C., office. Mr. Kramer will be the new Washington district manager. THOMAS ORR, who has just joined EPD, will take over its Cleveland office operation.

LINCOLN ELECTRIC CO., Cleveland, Ohio, has named G. N. BULL district manager of a new sales engineering district established in Florida. The office location is 3455 N. W. 54th St., Miami. RUSSELL S. HALE has been named district manager of the Boston engineering district.

Illinois

JOSEPH T. RYERSON & SON, INC., Chicago, Ill., announces the following new appointments; FRANK M. ROESE was named general superintendent, Boston plant, succeeding FRED M. MARTIN who becomes manager, post-tensioning sales, a division of the company's reinforcing products sales department. Martin will be headquartered in the general office, Chicago. Replacing Roese as superintendent of the center warehouse, Chicago plant, is FRANK J. SKRODENIS whose former post of superintendent, south warehouse, Chicago plant, is taken by WALTER K. JOHNSON. Johnson retains his duties as superintendent, structural fabricating shop. FRANK E. KOLB was appointed warehouse superintendent, Chicago plant, reporting to the general superintendent. He was suceeded as manager of the service department, Chicago, by EDWARD S. OWEN. HAROLD J. LEBECK has been made assistant manager of the industrial plastics and bearings division, with headquarters in Chicago.

CLEARING DIVISION, U. S. Industries, Inc., Chicago, Ill., announces that HENRY M. CROSSEN has been appointed director of manufactur-

Strictly routine...

for a

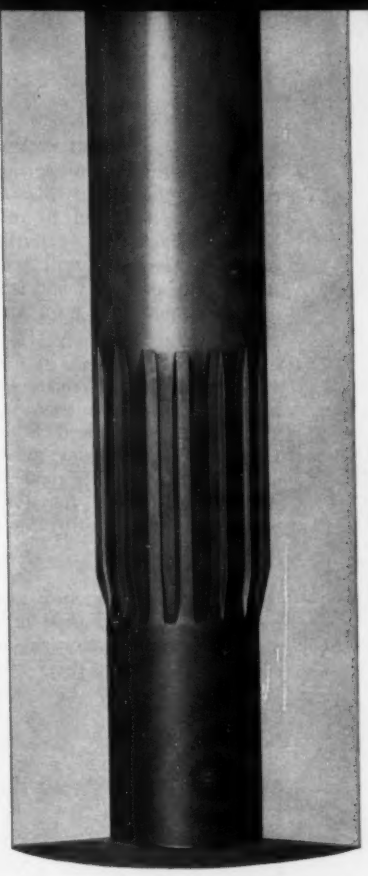
Cincinnati Intraform

Here are two different ID's separated by a blind spline . . . with part after part formed to ±.0005" tolerance for size and concentricity

You'd have to call for separate rough boring operations (watch the tolerances closely), a push broach operation, and a couple of internal grinds to produce the workpiece shown . . . *or call for a Cincinnati® Intraform!*

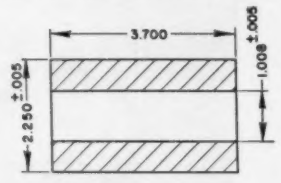
Not only would your Intraform produce this, and similar complex internal work, *in one continuous operation*, but to tight tolerances and at a high repetitive rate. Furthermore, you'd receive a part having superior metallurgical properties. Cold forming by the Cincinnati Intraform produces an uninterrupted grain flow, resulting in a part with higher fatigue life, and with excellent surface finish improvement.

Next time you're called upon to produce a run of parts having complex internal shapes, cross off conventional machining methods and call for a Cincinnati Intraform. (It gives your design men greater freedom, too.) For all details, write direct, or contact a Meta-Dynamics Division field engineer.

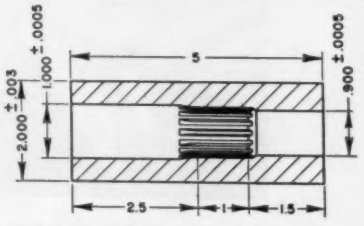


Section of steel shaft showing internal forming.

FACTS ABOUT THE JOB:



Starting blank of SAE 1040. ID tolerance, ±.005"; ID finish, 40 microinch.



Finished Intraformed part. Tolerance of ±.0005" held on ID's and overall concentricity of the three internal formed areas. ID finish, 16 microinch.

Intraform

META-DYNAMICS DIVISION

Machines for Metal Forming and Heat Treating

THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio, U.S.A.

CINCINNATI

ing. Mr. Crossen will replace JOHN A. MICHELOTTI, who was vice-president, manufacturing. Mr. Michelotti has been forced to relinquish his manufacturing activities for health reasons. He will retain the title of vice-president and remain in charge of purchasing for Clearing's plants.

ILLINOIS TOOL WORKS, Chicago, has purchased all manufacturing rights for the United States and Canada to the electronic module and capacitor components developed by ACF Industries, Inc., for use in radio and television circuitry and various defense projects.

GEORGE W. IRELAND has been named manager, general order and merchandise inventory department, of the Houston, Tex., plant of JOSEPH T. RYERSON & SON, INC., Chicago, Ill.

Maryland and Pennsylvania

PANGBORN CORPORATION, Hagerstown, Md., has opened a Vibratory Finishing Division at the company's headquarters. The division is headed by WILLIAM E. BRANDT.

William E. Brandt, manager–Vibratory Fininshing Division, Pangborn Corporation

REED INSTRUMENT BEARING CO., a division of SKF Industries, Inc., Philadelphia, Pa., has announced appointments to five key sales management positions: LEWIS P. DICKEY was named general sales manager; DONALD R. MACKAY, manager–eastern sales, Teterboro, N. J.; JAMES R. PETICOLAS, JR., manager–midwest sales, Melrose Park, Ill.; JOHN F. CHILTON, manager–western sales, Los Angeles; and ROBERT E. BRYANT, sales coordinator, Los Angeles.

CRUCIBLE STEEL COMPANY OF AMERICA, Pittsburgh, Pa., announces the retirement of WALTER H. WIEWEL from active service as senior vice-president. Mr. Wiewel, who with his retirement ended a career in steel which began fifty years ago, will continue to be associated with Crucible as a consultant.

FIRTH STERLING INC., Pittsburgh, Pa., announces the appointment of WILLIAM J. LOHMEYER as manager of high-speed steel sales. ZANE H. MARKLEY has been appointed sales engineer to handle the sales of the company's carbide products in Utah, and steel and carbide products in Colorado and northern New Mexico.

CARL C. GOBDEL has been appointed district sales manager at the Philadelphia plant of JOSEPH T. RYERSON & SON, INC. Previously manager of stainless-steel sales, he retains responsibility for coordinating the sale and promotion of this product.

PAUL H. MAGNUS II, vice-president of ROSEDALE FOUNDRY & MACHINE CO., Pittsburgh, Pa., has been elected executive vice-president.

Michigan

LAKE ERIE MACHINERY CORPORATION, Buffalo, N. Y., has reopened its Detroit district office and has appointed THEODORE L. THEODORFF as district manager, with offices in the Robinson Bldg., 18450 Livernois Ave. This office will serve Detroit and the eastern half of Michigan, as well as the western part of Ohio, including Cleveland, Cincinnati, and Toledo.

R. J. (DICK) CONROY has been appointed assistant sales manager of the WHITMAN & BARNES DIVISION of the United-Greenfield Corporation, Plymouth, Mich. Mr. Conroy, who was previously district manager of the company's Los Angeles office for ten years, will make his headquarters at the W & B main plant at Plymouth.

THOMAS J. BRIDGEMAN, sales engineer in the Detroit office of LATROBE STEEL CO., Latrobe, Pa., for the past twelve years, has been named assistant sales manager for the Detroit district. Prior to his assignment with the Detroit office, Mr. Bridgeman was employed in the Chicago district office for eight years.

COATED ABRASIVES, INC., announced the transfer of manufacturing and headquarters operations from Milwaukee, Wis., to the Detroit metropolitan area. The company's new manufacturing plant is located in Warren, Mich. General staff offices are at 11920 E. Eight Mile Road, Detroit 5, Mich.

EX-CELL-O CORPORATION, Detroit, Mich., has arranged to purchase the EASTMAN KODAK CO.'s contour projector business. E-Cell-O will acquire Kodak's inventory of completed projectors, projectors under construction, some production tools; and Kodak will continue to produce some parts.

C. E. HITCH has been made manufacturing manager at F. Jos. LAMB Co., Detroit, Mich. In his new position, Mr. Hitch will be responsible for all manufacturing activities at

C. E. Hitch, manufacturing manager, F. Jos. Lamb Co.

Lamb and FabriTec, a subsidiary producing parts-handling equipment.

WILLIAM BOURNIAS has been named chief engineer of BUHR MACHINE TOOL CO., Ann Arbor, Mich. He will be responsible for all engineering work and engineering personnel.

PARKER-HANNIFIN CORPORATION, Cleveland, Ohio, has appointed THOMAS F. O'ROURKE district manager of distributor sales for Michigan outside of metropolitan Detroit.

RALPH J. SPRESSER has been appointed district manager of the Detroit area for the NATIONAL ACME Co., Cleveland, Ohio.

Minnesota, Missouri and Wisconsin

DAVID S. FLINT has been appointed a mid-western tool and methods engineer for WALES-STRIPPIT, INC., Akron, N. Y. He will be headquartered in Minneapolis, Minn. In addition to Minnesota, his territory will include North and South Dakota and western Wisconsin.

PARKER-HANNIFIN CORPORATION, Cleveland, Ohio, has announced the franchisement of ELLIS AKIN ENGINEERING Co., 2934 Cherry, Kansas City, Mo., as a distributor for Crown compressed air line units.

FRANK HYNES has been appointed to the post of manager of military sales of the ELECTRIC PRODUCTS DIVISION of Vickers Incorporated, St. Louis, Mo.

HARRY L. WARDRIP has been appointed by the DUMORE Co., Racine, Wis., as vice-president in charge of sales, with full responsibility for all Dumore sales and promotional activities.

New England

ALLIED PRODUCTS DIVISION, the Motch & Merryweather Machinery Co., has been appointed exclusive sales agent for the TAFT-PEIRCE MFG. CO., Woonsocket, R. I. Operating from its offices at 875 Greentree Road, Pittsburgh, and at 1250 E. 222nd St. in Cleveland, M & M will sell products of the Taft-Peirce Small Tool & Gage Divisions throughout eastern Ohio, western Pennsylvania, and the entire state of West Virginia.

NORTON Co., Worcester, Mass., announces that DR. WILFRED F. L. PLACE has been appointed vice-president and general manager of Norton International Inc., the company's foreign division. He succeeds

Dr. Wilfred F. L. Place, vice-president and general manager, Norton International Inc.

FRANK M. RYAN who retired on January 29. Dr. Place will have his headquarters in Worcester. He became a vice-president of Norton International Inc. in charge of Behr-Manning products in 1957.

HARTFORD MACHINE SCREW Co., Hartford, Conn., a division of Standard Screw Co., has announced the joint promotions of J. F. MILLER and M. J. PERRIN to vice-presidents. Mr. Miller steps up from general sales manager to vice-president–sales, while Mr. Perrin, who was formerly factory manager, becomes vice-president–manufacturing.

BRUCE A. WHITE has been appointed a field representative for both chuck and valve product lines for western Massachusetts, eastern New York, northern Connecticut, and the state of Vermont for the SKINNER CHUCK Co., New Britain, Conn. He will make his headquarters in New Britain.

BUTTERFIELD DIVISION, Union Twist Drill Co., Derby Line, Vt., has appointed RONALD E. QUIGLEY sales supervisor in the midwest. His headquarters will be in Chicago. HOWARD J. BAETZ has been appointed sales supervisor in the Great Lakes area, with headquarters in Detroit.

G. BRUCE WILSON has been appointed assistant eastern regional sales manager for NORMA-HOFFMAN BEARINGS CORPORATION, Stamford, Conn.

GEORGE W. STEINMETZ has been appointed manager of industrial distribution for PRATT & WHITNEY Co., INC., West Hartford, Conn.

E. E. "AL" RIDDLE, sales engineering representative on the West Coast for the CUSHMAN CHUCK Co., Hartford, Conn., announces the addition of DALE F. HOLMES to the West Coast sales staff. Mr. Holmes will concentrate his efforts in southern California and part of Arizona.

JESSE STITZER has been named engineering manager of SORENSEN & Co., South Norwalk, Conn. Mr. Stitzer was formerly manager of the company's high voltage systems laboratory.

Jesse Stitzer, engineering manager, Sorensen & Co.

New York and New Jersey

CARPENTER STEEL Co., Reading, Pa., has appointed FENTON R. MITCHELL, JR., as branch manager, New York and Bridgeport, Conn. Mr. Mitchell will be responsible for sales and operations of warehouses in both territories. The company's New York warehouse is located at Woodside, L. I. The company has also appointed ROBERT P. UHL to the post of Atlantic regional manager. In his new position, Mr. Uhl will be responsible for sales in the areas served by the warehouses in Philadelphia, North Jersey, New York, Providence, Hartford, and Bridgeport. He will be located at Carpenter's Woodside, L. I., N. Y., mill-branch warehouse.

AUTOMATION GAGES, INC., Rochester, N. Y., announce the appointment of sales representatives in two

water

comes in oceans, rivers, lakes, wells,
drops, buckets, pitchers and glasses.
it quenches thirsts, cooks food, puts
out fires, makes coffee and
brushes teeth. it spins mills,
runs electro-plants, cools motors
and power factories.
it spawns fish, sprinkles lawns,
floats boats, washes children
and grows flowers.

it sustains and nurtures.
it bends if you give it purpose.
it reshapes itself if you give it reason.
it is needed, wanted, feared,
praised and prayed for.

it is at the heart of all life.
it is in the arteries of all industry.
it is as close to us as skin
but as taken for granted as sky.

the end of water seems unbelievable.
if it is not on the horizon, it is just over it.
if it is not within sight,
it is just 'round the bend.
if it is not in the glass,
it is just in the spigot.

. . . this is the grand mirage . . .
the self-delusion that prevails
though the wells run low
and the streams go dry
and the water slips away.

we know water.
we know its ways.
we've learned its habits.
we've pulled it out of swamplands,
pushed it over mountains,
pumped it into deserts,
tunneled it through granite,
and rescued it from pollution.

above all else,
we know the need for it.
that is why,
for 130 years,
we've developed new uses for,
powered new factories with,
diverted the courses of
and jealously stood guard over
water.

Fairbanks, Morse

A MAJOR INDUSTRIAL COMPONENT OF FAIRBANKS WHITNEY CORPORATION, NEW YORK

No other manufacturer makes pumps for such a variety of hydraulic applications as Fairbanks, Morse. If it's liquid . . . if it flows . . . we make the pumps that move it . . . at low cost per gallon . . . in sizes from 200 gph to 800,000 gpm, and to 3000 psi . . . for every industrial need.

Our pumps . . . our generators and controls . . . our new rotary compressors . . . our drive toward better ways to de-salt ocean water . . . the potential of our advance Research & Development Center in Beloit . . . our lead position in the field of Hydrodynamics . . . all of these equip us to serve you.

Send for our brochure—"Hydrodynamics." Please write to Mr. Robert W. Kerr, President, Fairbanks, Morse & Company, 600 South Michigan Ave., Chicago 5, Illinois.

new areas. S. E. SHERRY Co., 6514 Westminister Drive, Cleveland 29, Ohio, has been assigned to cover the Cleveland and northeastern Ohio area. Representation in the Philadelphia and eastern Pennsylvania area is assigned to GEORGE MAIER Co., 40 Wyncroft Drive, Media 32, Pa.

SOCIETY OF AUTOMOTIVE ENGINEERS, INC., New York City, announces that HARRY E. CHESEBROUGH, vice-president of Chrysler Corporation and general manager, Plymouth-DeSoto-Valiant Division, is the president-elect of the society. Mr. Chesebrough was officially installed during the SAE Annual Meeting, which was held in Detroit January 11-15.

STAVER HYDRAULICS Co., 1566 State St., Schenectady 8, N. Y., has been established as a distributor for Parker industrial tube and hose fittings and Crown compressed air system units for Parker-Hannifin Corporation, Cleveland, Ohio. Staver is also franchised to handle O-rings made by Parker Seal Co., Culver City, Calif.

AIRBORNE INSTRUMENTS LABORATORY (AIL), Deer Park, N. Y., announced the appointments of DR. E. G. FUBINI and DR. G. C. COMSTOCK as vice-presidents. Dr. Fubini was named vice-president in charge of research and systems engineering and Dr. Comstock, vice-president in charge of the electronic systems and techniques division.

JOSEPH T. RYERSON & SON, INC., Chicago, Ill., announces the appointment of WALLACE E. FELLDIN as sales manager of the New York plant. He succeeds HENRY B. WILLIAMS, who was named special assistant and sales consultant to the general manager.

LINCOLN ELECTRIC Co., Cleveland, Ohio, has named E. LARRY SMITH district manager of the company's New York sales engineering district and JOHN H. MCFEETERS district manager of the Albany district.

JAN M. GARVIN has been appointed director of marketing for USI ROBODYNE, a division of U. S. Industries, Inc., New York City.

AMERICAN METAL CLIMAX, INC., and its operating divisions now occupy space in a modern building bearing the company name, at 1270 Avenue of the Americas, New York City.

C. H. GLASIER has been appointed executive vice-president of Air Reduction Sales Co., New York City.

OTTO J. MANSE has been named manager of manufacturing at ROLLWAY BEARING Co., Syracuse, N. Y.

LAD J. BAYER has been appointed general manager of the CONTROL INSTRUMENT DIVISION of the Warner & Swasey Co., Cleveland, Ohio. The division, which is engaged in research activities, has just moved its manufacturing operation from New York City to expanded facilities in Flushing, L. I.

Lad J. Bayer, general manager—Control Instrument Division, Warner & Swasey Co.

L. S. STARRETT Co., Athol, Mass., announces the relocation of its New York branch with the opening of an integrated sales office and warehouse building at 48 Commerce St., Springfield, N. J.

Ohio

CLARENCE R. BURRELL has resigned as vice-president in charge of sales for the Tool Steel Gear & Pinion Co., Cincinnati, Ohio, to become president of the recently organized TOOL STEEL PRODUCTS SALES CORPORATION. The new corporation will have its headquarters at 7711 Camargo Road in Cincinnati, and will act as exclusive sales agent for the Tool Steel Gear & Pinion Co. in a wide midwestern and southern area. It will also act as exclusive sales agent for the Badall Co., Inc., Hammond, Ind., a wholly owned subsidiary of Tool Steel Gear & Pinion.

LOUIS POLK, JR., has been appointed manager of operations of the product divisions of the SHEFFIELD CORPORATION, a subsidiary of Bendix Aviation Corporation, Dayton, Ohio. Mr. Polk's new assignment is in addition to his continuing responsibilities as assistant vice-president and manager of the instruments and systems division, and direction of Sheffield's domestic and Canadian service plants. THREADWELL TAP & DIE Co. of Greenfield, Mass., a Sheffield subsidiary, now comes under the direction of Mr. Polk.

DENISON ENGINEERING DIVISION, American Brake Shoe Co., Columbus, Ohio, has announced the formation of a new north central sales region which will be headed by D. J. ARNOLD as regional manager and will handle the sales and distribution of the company's "Multipress" and hydraulic pumps, motors, and controls from its regional office at 5530 State Road, Cleveland. Operating under the direct supervision of Mr. Arnold are district offices located at Detroit, Mich.; Pittsburgh, Pa.; and Dayton, Ohio.

LINCOLN ELECTRIC Co., Cleveland, Ohio, announces the appointment of JOHN FARRAN as director of service. He succeeds G. E. TENNEY, who recently retired. In his new position, Mr. Farran will control the service department activities including the Lincolnditioning Program of remanufacturing, the Lincoln Exchange Program for major parts replacement, and replacement parts sales.

HERCULES MOTORS CORPORATION, Canton, Ohio, has elected ADOLPH A. KARRASCH vice-president in charge of manufacturing and WILLIAM P. PORCH treasurer and a director. JOHN D. COOK was re-elected secretary. Mr. Karrasch, who joined Hercules early in 1959 as director of manufacturing, will also be responsible for purchasing department activities.

HERMAN SCHROLL has been appointed sales manager for the Die Supply Division of E. W. BLISS Co.,

Canton, Ohio. Mr. Schroll's new headquarters will be at the division's main office, 1400 Brookpark Road, Cleveland 9.

WELDON TOOL CO., Cleveland, Ohio, announces that S. E. SMITH, JR., has been named general sales manager, succeeding J. H. DEVLIN, vice-president in charge of sales, who retired on December 31, 1959, after twenty-two years of service.

R. L. FREDERICK has been appointed executive director–International Division of the TIMKEN ROLLER BEARING CO., Canton, Ohio. Mr. Frederick will be in charge of coordinating the company's international operations.

BYRON MUMAW has been appointed superintendent of machine and erection shops for the E. W. Bliss Co.'s Rolling Mill Division, Salem, Ohio.

Obituary

Harry Pelphrey

HARRY PELPHREY, director of research of Michigan Tool Co., Detroit, Mich., died in that city several weeks ago. He was widely regarded as one of the country's leading research engineers on gears and gear manufacturing, and was a member of many professional and philanthropic organizations.

New Books

TOOL ENGINEERING. By S. E. Rusinoff. 326 pages; illustrated; 5 1/2 by 8 1/2 inches. Published by American Technical Society, 848 E. 58th St., Chicago 37, Ill. Price, $6.75.

Modern mass-production techniques require men who have a working knowledge of all the technical phases of production–men who are cost-conscious, good coordinators, and students of exact methods. Such men, commonly called tool engineers, are in great demand in industry.

It is for the purpose of furthering the training of these men that this book was written. It defines the responsibilities of the tool engineer which include: (1) planning the processes of production, (2) developing the tools, and (3) integrating the facilities of manufacture.

The author thoroughly covers the analysis and comparison of costs which are necessary in selecting the tools, equipment, and processes best adapted to the product and to the future plans of the manufacturer. He views such areas as tool design, estimating, dimensions and tolerances, and quality control from the tool engineer's position.

ENGINEERING MECHANICS. By Dwight F. Gunder and Derald A. Stuart. 391 pages; illustrated; 6 by 9 1/4 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $7.75.

This volume provides a clear transition between the classic approach to engineering mechanics and the newer vector treatment. It is based on the author's experience that students find mechanics easier and more comprehensible in the vector notation, and that they benefit in their later courses in engineering by the knowledge of this notation. It is designed not only for engineering students who plan to take graduate training, but for others as well. In addition, it serves as a valuable reference for the engineer who would like to add the vector to his equipment.

Chapters include: Basic Concepts and Definitions, Vectors, Physical Problems, Methods of Work and Energy, Motion of a Particle (Kinematics), etc.

PLANNING NEW PRODUCTS. By Philip Marvin. 102 pages; illustrated; 8 1/2 by 11 inches. Published by Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio. Price, $3.

This compilation of articles from *Machine Design* has chapters including: Planning Product Strategy for Long-Range Growth and Profit, Developing Strong Product Lines, Research for Results, Engineering Profitable Products, Evaluating Engineering Operations, etc.

Coming Events

APRIL 21-28–ASTME Tool Show will be held at Detroit Artillery Armory, Detroit, Mich. For additional information write to Leonard Abrams, exposition manager, American Society of Tool and Manufacturing Engineers, 10700 Puritan Ave., Detroit 38, Mich.

APRIL 25-26–ASME Maintenance and Plant Engineering Conference will be held at the Chase-Park Plaza Hotel, St. Louis, Mo. For additional information, write to L. S. Dennegar, director of public relations, ASME, 29 W. 39th St., New York 18, N. Y.

APRIL 25-29–ASME Metals Engineering Division–AWS Conference will be held at the Biltmore Hotel, Los Angeles, Calif. For further information: L. S. Dennegar, director of public relations, ASME, 29 W. 39th St., New York 18, N. Y.

MAY 9-13–Southwestern Metal Exposition will be held at State Fair Park, Dallas, Tex. For further information inquire of Chester L. Wells, exposition manager, the American Society for Metals, Metals Park, Novelty, Ohio.

MAY 17-19–ASME Production Engineering Conference will be held at the Schroeder Hotel, Milwaukee, Wis. For additional information: L. S. Dennegar, director of public relations, ASME, 29 W. 39th St., New York 18, N. Y.

MAY 23-26–ASME Design Engineering Conference and Show will be held at the Statler-Hilton Hotel, New York, N. Y. For further information: L. S. Dennegar, director of public relations, ASME, 29 W. 39th St., New York 18, N. Y.

JUNE 5-9–Summer Annual Meeting and Aviation Conference of the American Society of Mechanical Engineers to be held at Statler-Hilton Hotel, Dallas, Tex. For further information: L. S. Dennegar, director of public relations, ASME, 29 W. 39th St., New York 18, N. Y.

This is

Stuart's

new
HI-D
at work

This is what HI-D is...

A new *transparent* metalworking compound — a *petrochemical* compound possessing the high detergency of synthetics but none of their disadvantages. Often described as a hybrid—Hi-D is not truly an emulsion, and not anything like a straight chemical compound. Turn the page to see how this new type of cutting fluid can help you

This is what

Stuart's

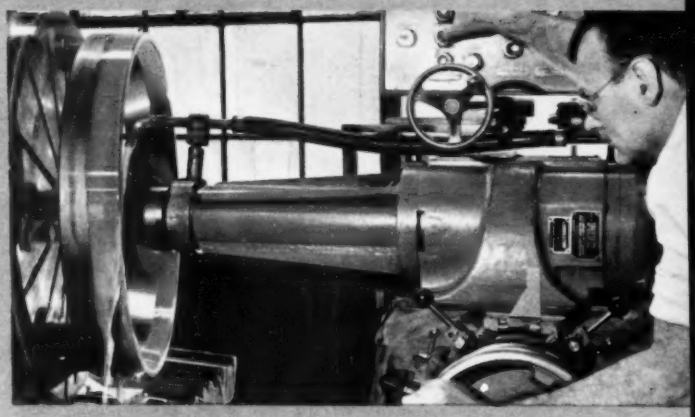
new **HI-D** will do...

Keep grinding wheels open and free-cutting. Permit standardization of wheels—do more different jobs with fewer wheels. Minimize machine tool maintenance. Aid chip formation to produce fine surface finishes. Lubricate efficiently as it cleans. Remain effective and stable at 60:1 for grinding and at 40:1 for cutting—even after picking up tramp oil. Settle chips quickly in an ordinary sump—produce controlled foam in a flotation-type filtering system. Inhibit rust, even at mixtures greater than 60:1.

This is how

Stuart's

new **HI-D** has helped others...



LaSalle Steel Company reduced cutting fluid costs by 45%, using Hi-D for everything from ¼" roughing cuts on lathes to fine finish grinding. At 50:1, Hi-D stops in-plant rust on highly finished steel bar stock.

The Torrington Company, Bantam Bearing Division, saves ½ on lubricant costs by using Hi-D at 60:1 on 87 grinders. Hi-D trims *hidden costs,* too, because Torrington dresses wheels only ⅓ as often as before. Think of the savings in wheel and diamond life. Direct costs are slashed on some jobs because both rough- and finish-grinding are done with the same wheel. As for finish, Hi-D eliminates 95% of chip "feedback" from the filtering system.

Stuart's **HI-D** replaces five cutting fluids in diversified plant

Here's how Hi-D's combination of detergency and lubricity slashes lubrication costs for one company on 20 different jobs that range from sawing to surface grinding:

1. **Sawing**—Elimination of chip welding improves blade life. Ability to perform at 10:1 (5:1 formerly required) reduces carry-off and waste.
2. **Turning**—Production is increased by stepping up feed from .030 to .060 ipm. Depth of cut is increased from ⅛" to ¾".
3. **Mills**—Rancidity is eliminated.
4. **Surface grinding**—Wheel life is increased, downtime is decreased, because petrochemical compound Hi-D keeps wheels open and free-cutting.

On every application, Hi-D matches or betters the performance of five compounds replaced. Cutting fluid inventory and handling costs are reduced. Using Hi-D in the toolroom and cutoff department (serviced by a central system) saves 50 to 60 gallons of cutting fluid per week.

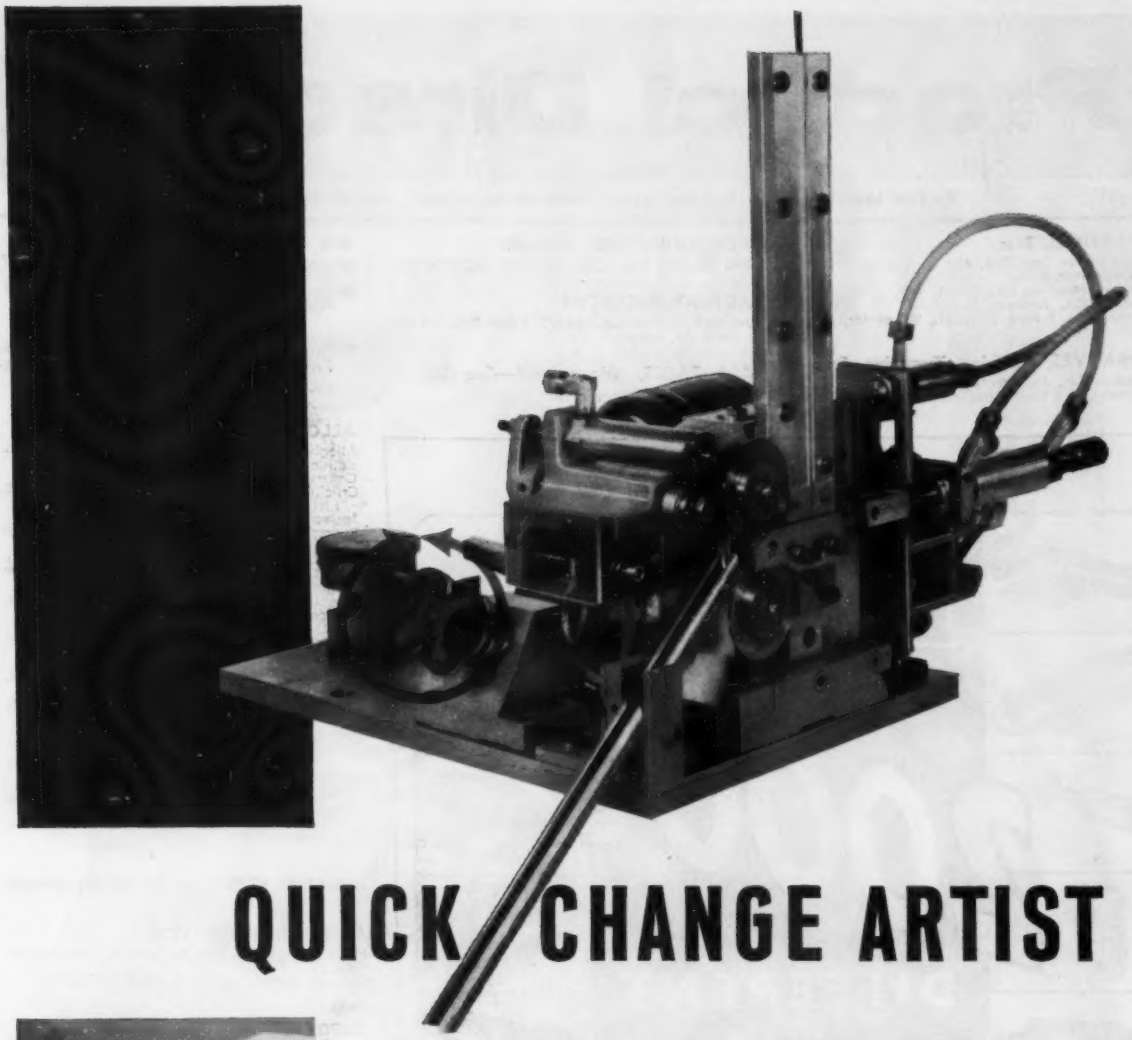
The way to evaluate potential savings in *your* plant is to test Stuart's new Hi-D on a variety of operations. Or, send for free test samples of Hi-D in both concentrate and mixture form that will demonstrate its transparency, lubricity, and stability. Phone your Stuart representative or the factory—BIshop 7-7100.

FREE SAMPLE

Stuart

D. A. STUART OIL CO., LIMITED
2727 South Troy Street, Chicago 23, Illinois

CANADIAN D. A. STUART OIL CO., LTD.
P.O. Box 430, 43 Upton Road, Scarborough, Ontario, Canada



QUICK CHANGE ARTIST

Here's "packaged tooling" for internal grinding that's really versatile. With the turn of a single knob, fixtures can be interchanged to permit rapid set-up away from the machine. Production continues with hardly an interruption.

Quick change "packaged tooling" is only one of the many exclusive features of the Bryant Model "B" Centalign® — features which are helping manufacturers of miniature components establish new records for accuracy and production.

If you are grinding the bores or raceways in miniature bearings or similar parts, investigate the Bryant Model "B" Miniature Centalign. It will repay you in increased profits.

P.S. Space is no problem with the Bryant Miniature Centalign. It packs all its job-engineered features in only 8¼ square feet.

BRYANT Chucking Grinder Co.

85 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Springfield, N. J. • Cleveland • Detroit • Indianapolis • Chicago • Los Angeles

Internal Grinders • Special Machinery

For more data circle this page number on card at back of book

Product Directory

To find headings easily, look for capital letters at top of each page to denote location.

ABRASIVES, Disc
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., Beloit, Wis.
Macklin Co., Jackson, Mich.
Norton Co., 1 New Bond St., Worcester, Mass.

ABRASIVES, Polishing, Tumbling, Etc.
Macklin Co., Jackson, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.

ACCUMULATORS, Hydraulic
Erie Foundry Co., 1253 W. 12th St., Erie, Pa.

ACTUATOR SCREWS
Jerpbak-Bayless Co., 34170 Solon Rd., Cleveland 39, Ohio

AIR GAGES, Dimensional—See Gages Air Comparator

AIR GUNS
Chicago Pneumatic Tool Co., New York 17, N. Y.
Schrader's Sons, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.

AIR TOOLS—See Grinders, Portable, Pneumatic—Drills, Portable, Pneumatic, Etc.

ALLOY STEELS
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Tool Steel Co., Chicago Hts., Ill.
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Jessop Steel Co., Washington, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOYS, Bearing
Bunting Brass & Bronze Co., 715 Spencer, Toledo 1, Ohio
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Mueller Brass Co., Port Huron, Mich.

ALUMINUM and Aluminum Products
Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.
Ryerson & Son, Jos. T., 16th & Rockwell Sts., Chicago 8, Ill.

ANGLE PLATES—See Set-up Equipment

ANNEALING FURNACES
Eisler Engrg. Co., 750 So. 13th St., Newark 3, N. J.
General Electric Co., Schenectady 5, N. Y.

ARBOR PRESSES—See Presses Arbor

ARBORS AND MANDRELS
Birdsboro Corp., Birdsboro, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill. (end mills)
Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio
Jacobs Mfg. Co., West Hartford, Conn.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Logansport Mach. Co., Inc., Logansport, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland 14, Ohio
Woodworth, N. A. Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

ARC WELDERS—See Welding Equipment, Arc

ASSEMBLING MACHINES
Detroit Power Screwdriver Co., 2799 W. Fort St., Detroit 16, Mich.
Lamb F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Sheffield Corp., Box 893, Dayton 1, Ohio

AUTOMATIC SCREW MACHINES—See Screw Machines, Single and Multiple-Spindle Automatic

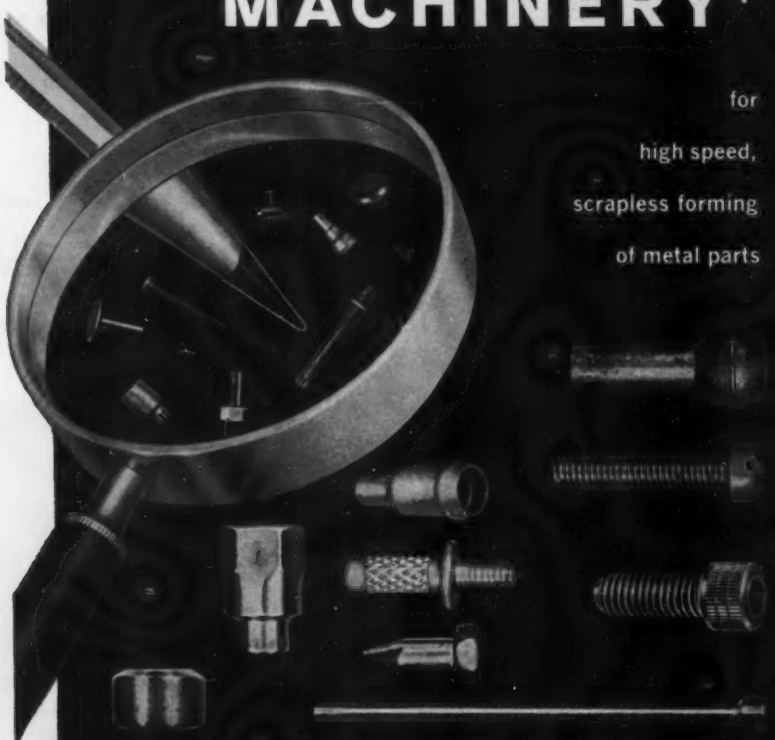
BABBITT
Ryerson, Joseph T. & Son, Inc., 16th & Rockwell Sts., Chicago 8, Ill.

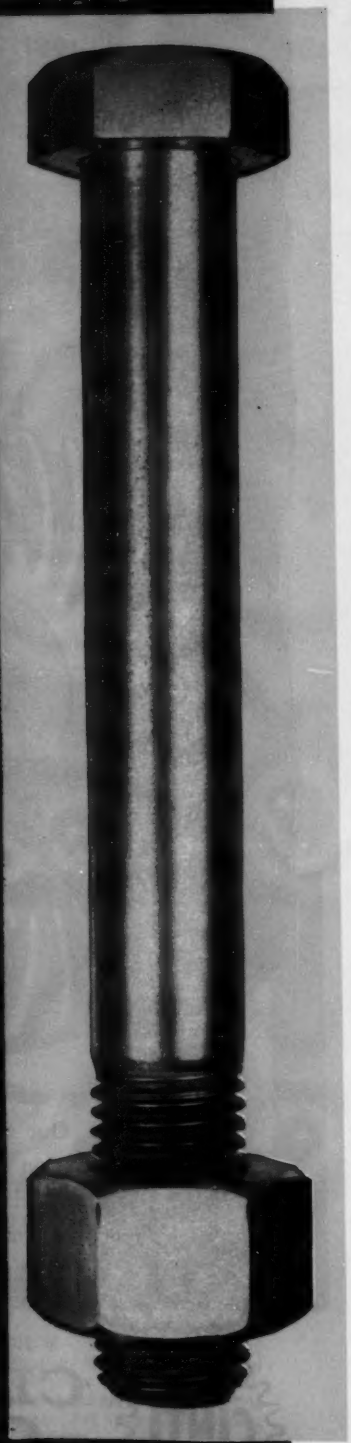
WATERBURY FARREL
MACHINERY BUILDERS

BUILDS A WIDE RANGE OF

COLD HEADING MACHINERY*

for high speed, scrapless forming of metal parts



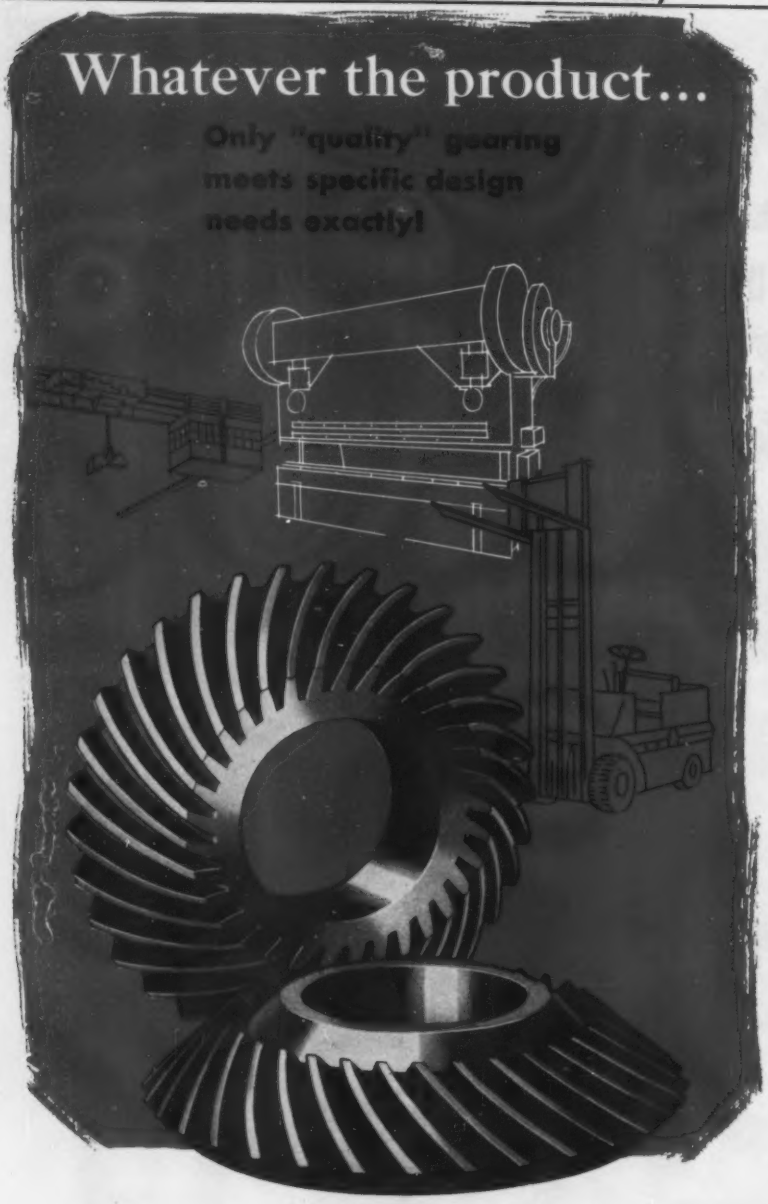


*includes: cold headers (single or double blow) progressive headers, nut formers, parts formers, thread rollers, slotters, trimmers, and pointers; also special purpose headers and auxiliary equipment

THE WATERBURY FARREL FOUNDRY & MACHINE CO.
Waterbury, Connecticut, U.S.A.

Sales Offices: Chicago • Cleveland • Los Angeles • Millburn, N. J.

For more data circle this page number on card at back of book



Cincinnati gears are GUARANTEED to meet specifications exactly. Our skilled craftsmen operate the most up-to-date precision machines for gear cutting, finishing, and inspection. And our unique production control assures delivery as promised.

Send us your prints for quotation.

CINTI®

THE CINCINNATI GEAR CO.

Wooster Pike and Mariemont Ave. Cincinnati 27, Ohio
Custom Gear Makers Since 1907

GEARS, good gears only

BACTERICIDES
Oakite Products, Inc., 26 Rector St., New York 6, N. Y.

BALANCING EQUIPMENT
Coso Corp., 405 Lexington Ave., New York 17, N. Y.
DoALL Co., Des Plaines, Ill.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Orban Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Sundstrand Mach. Tool Co., 2531 11th St., Rockford, Ill.

BALLS
Hoover Ball & Bearing Co., Ann Arbor, Mich.
Kennametal, Inc. Latrobe, Pa.

BAR MACHINES—See Screw Machines, Single and Multiple-Spindle, Automatic

BAR STOCK, Non-ferrous
Bunting Brass & Bronze Co., 715 Spencer, Toledo, Ohio
Mueller Brass Co., Port Huron, Mich.
Ryerson, Joseph T. & Son, Inc., 16th & Rockwell Sts., Chicago 8, Ill.
Shenango Furnace Co., Dover, Ohio

BAR STOCK AND SHAFTING, Steel
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Boston Gear Works, 14 Hayward St., Quincy 71, Mass.
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Jessop Steel Co., Washington Pa.
Ryerson, Joseph T. & Son, Inc., 16th & Rockwell Sts., Chicago 8, Ill.

BEARING PILLOW BLOCKS AND CARTRIDGES
Fafnir Bearing Co., New Britain, Conn.

BEARINGS, Ball
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., Poughkeepsie, N. Y.
Hoover Ball & Bearing Co., Ann Arbor, Mich.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., 30th & Hunting Park Ave., Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
S K F Industries, Inc., Philadelphia, Pa.

BEARINGS, Bronze and Special Alloy
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., 715 Spencer, Toledo, Ohio

BEARINGS, Oilless
Bunting Brass & Bronze Co., 715 Spencer, Toledo, Ohio
Ryerson, Joseph T. & Son, Inc., 16th & Rockwell Sts., Chicago Ill.

BEARINGS, Roller
Ball & Roller Bearing Co., Danbury, Conn.
International Ball & Roller Bearing Corp., 3123 Eastlake, Seattle 2, Wash.
Marlin-Rockwell Corp., 402 Chander Bldg., Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Rollway Bearing Co., Inc., 541 Seymour St., Syracuse, N. Y.
S K F Industries, Inc., Philadelphia, Pa.
Timken Roller Bearing Co., Canton, Ohio

BEARINGS, Thrust
Ball & Roller Bearing Co., Danbury, Conn.
Bunting Brass & Bronze Co., 715 Spencer, Toledo, Ohio
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Rollway Bearing Co., Inc., Syracuse, N. Y.
S K F Industries, Inc., Philadelphia, Pa.
Timken Roller Bearing Co., Canton, Ohio

BUNTING® BEARINGS

Bringing the **most modern bearings** to the small lot and occasional buyer

Today your local Bunting Distributor can give you all the advantages of the most advanced bearing metallurgy. Available instantly from distributor stocks are finished bearings and bars made of Bunting Cast Bronze and Sintered Bronze, and Bunting Bearing Aluminum Bars.

The many hundreds of stock sizes of Bunting finished bearings and bars in these most modern metals meet practically every mechanical and cost requirement for machinery production and maintenance.

MACHINE SHOP SERVICE: Small lots of special design bearings, not obtainable from stock, can be procured immediately from fully equipped machine shops in Bunting branches. The wide range of sizes of Bunting Stock Cast Bronze and Sintered Bronze Bearings makes the alteration of a stock item to a special bearing easy and economical. Bunting Cast and Sintered Bronze and Bunting Bearing Aluminum Bars provide the materials for special sizes which cannot be made from stock bearings. Your local Bunting Distributor can arrange for such work.

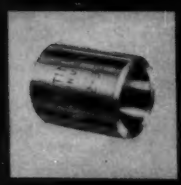
Case in Point

Bunting Bearings available from stock provide without further finishing a bearing suitable for practically any usual application, and in dimensions ranging from 3/16" ID x 5/16" OD x 1/2" long to 5" x 6" x 9".

1. Typical Cast Bronze Stock Bearing

2. Sintered Bronze Stock Flange Bearing

3. Sintered Bronze Stock Thrust Bearing



4. Sintered Bronze Stock Plain Bearing

Ask for Catalogs:

No. 158—Complete listing of sizes of Bunting Cast Bronze and Sintered Bronze Bearings and Bars, and Bunting Bearing Aluminum Bars. Pocket size edition.

No. 258—Complete listing of Cast Bronze Electric Motor Bearings for all makes and sizes of electric motors.

No. 46—Technology of Bunting Bearing Aluminum. A technical treatise on the composition, machining and use of this new bearing metal. Ask your local Bunting Distributor.

THE BUNTING Brass and Bronze Company · Toledo 1, Ohio · Branches in Principal Cities

BEARINGS, BUSHINGS, BARS AND SPECIAL PARTS OF CAST BRONZE, SINTERED METALS OR ALUMINUM ALLOYS

BELT SANDERS—See Grinding Machines, Abrasive Belt

BENCH CENTERS

Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Sundstrand Mch. Tool Co., 2531—11th St., Rockford, Ill.

BENDERS, Bar, Tube, Channel, etc.

Greenlee Bros. & Co., 2136—12th St., Rockford, Ill.
Wallace Supplies Mfg. Co., 1310 W. Diversey Parkway, Chicago 14, Ill.
Wood, R. D., 1072 Public Ledger Bldg., Philadelphia 5, Pa.

BENDERS, Plate, Etc.

Cincinnati Shaper Co., P.O. Box 111, Cincinnati 11, Ohio
Niagara Mch. & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Wallace Supplies Mfg. Co., 1310 W. Diversey Parkway, Chicago 14, Ill.

BENDING MACHINES, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engineering Div. American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Niagara Machine & Tool Works, 638 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wallace Supplies Mfg. Co., 1310 W. Diversey Parkway, Chicago 14, Ill.

BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Wallace Supplies Mfg. Co., 1310 W. Diversey Parkway, Chicago 14, Ill.

BENDING ROLLS

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., Cleveland, Ohio.
Niagara Mch. & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Wallace Supplies Mfg. Co., 1310 W. Diversey Parkway, Chicago 14, Ill.

BLAST CLEANING EQUIPMENT

Pangborn Corp., Hagerstown, Md.

BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

BLUING LAYOUT

Dykem Co., 2307 N. 11th St. Louis 6, Mo.

BOLT and NUT MACHINES

Orban Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Waterbury Farrel Foundry & Mach. Co., Waterbury, Conn.

BOLTS, NUTS and SCREWS

Allen Mfg. Co., Bloomfield, Conn.
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Northwestern Tools, Inc., 115 Hollier Ave., Dayton 3, Ohio.
Orban Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Williams, J. H. & Co., 400 Vulcan St., Buffalo, 7, N. Y.

BOOKS, Technical

Industrial Press, 93 Worth St., New York 13, N. Y.

BORING BARS

Armstrong Bros. Tool Co., 5913 W. Armstrong Ave., Chicago 46, Ill.
Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
DeVlieg Microbore Div., 2720 W. Fourteen Mile Road, Royal Oak, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kennametal Inc., Latrobe, Penna.
Metallurgical Products Dept. of General Electric Co., Box 327, Roosevelt Park Annex, Detroit 32, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Universal Engrg. Co., Frankenmuth 2, Mich.
Van Norman Machine Co., 3460 Main St., Springfield 7, Mass.
Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BORING HEADS

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Bryant Chucking Grinder Co., Springfield, Vt.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
DeVlieg Microbore Div., 2720 W. Fourteen Mile Road, Royal Oak, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Mummert-Dixon Co., Hanover, Pa.
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4, Ohio
Universal Engrg. Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.

BORING MACHINES

Austin Industrial Corp., White Plains, N. Y.
Baker Bros. Inc., 1000 Post Ave., Toledo 10, Ohio
Buhr Machine Tool Co., 839 Greene St., Ann Arbor, Mich.
Bullard Co., Bridgeport 6, Conn.
Burg Tool and Mfg. Co., Inc., 15001 S. Figueroa, Gardena, Calif.
Consolidated Mch. Tool Div., 565 Blossom Rd., Rochester 10, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Cross Co., P. O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.
Davis & Thompson Co., 4460 N. 24th St., Milwaukee 10, Wis.
DeVlieg Machine Co., Fair St., Royal Oak, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray Co., G. A., 3611 Woodburn Ave., Cincinnati 7, Ohio
Hamilton Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.

NEW Automatic Loading and Feeding for Grieder Tube Cut-Off Machines ...4500 to 6500 cut-offs per hour!

The Grieder automatic loader and feeder holds up to 15,000 pounds of tubing and will automatically feed the entire load through a Grieder Tube Cut-Off Machine without attention from the operator. Standard stock cradle handles 22' lengths. Shorter or longer capacities are available. Note! This equipment will also feed round stock to other types of machinery.

- Grieder Tube Cut-Off Machines cut tubing of any shape to any length faster than any other machine.
- Length tolerance plus or minus .002" on light wall tubing, .003" on heavier.
- Precision clamping dies prevent tube distortion and provide clean, quality cuts. Tube does not rotate.

Write for literature. Tell us sizes of steel, copper, brass, aluminum or alloy tubes to be cut and production requirements.

GRIEDER INDUSTRIES, INC.
P. O. Box 169 • Bowling Green, Ohio

Please send bulletin describing Grieder Tube Cut-Off Machines.

NAME_____
COMPANY_____
CITY_____ ZONE____
STATE_____

Grieder
TUBE CUT-OFF MACHINES

Jones & Lamson Machine Co., Springfield, Vt.
Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Moline Tool Co., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Olivetti Corp. of America, 42-33 Northern Blvd., Long Island City 1, N. Y.
Orban Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Box 893 Dayton 1, Ohio
Snyder Corp., 3400 E. Lafayette Ave., Detroit 7, Mich.
Wales-Strippit, Inc., Akron, N. Y.
Wickes Mch. Tool Div., Wickes Corp., Saginaw, Mich.

BORING MILLS, Horizontal

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Bullard Co., Bridgeport 6, Conn.
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio
Consolidated Mch. Tool Div., 565 Blossom Rd., Rochester 10, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
DeVlieg Machine Co., Fair St., Royal Oak, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., 3611 Woodburn Ave., Cincinnati 7, Ohio
Innocenti, Milan, Italy
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio
New Britain Mch. Co., New Britain, Conn.

BORING MILLS, Vertical

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Berthiez, Charles, 5 Rue Montalivet, Paris, France
Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.
Consolidated Mch. Tool Div., 565 Blossom Rd., Rochester 10, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Hamilton Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio
Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.
King Machine Tool Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
New Britain Mch. Co., New Britain, Conn.

BORING TOOLS

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 46, Ill.
Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
DeVlieg Microbore Div., 2720 W. Fourteen Mile Road, Royal Oak, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Maxwell Industries, Inc., Ashtabula, Ohio
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BRAKES, Press and Bending

Cincinnati Shaper Co., P. O. Box 111, Cincinnati 11, Ohio
Cleveland Crane & Engrg. Co., Wickliffe, Ohio
Lodge & Shipley Co., Hamilton 1, Ohio
Niagara Mch. & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

BRASS

American Brass Co., 25 Broadway, New York N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass, Inc., 230 Park Ave., New York, N. Y.

BROACHES

Equitable Engineering, Royal Oak, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Lapointe Machine Tool Co., Hudson, Mass.
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Sundstrand Mch. Tool Co., 2531—11th St., Rockford, Ill.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.

BROACHING MACHINES, Internal

Lapointe Machine Tool Co., Hudson, Mass.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Pioneer Broach Co., 6434 Telegraph Rd., Los Angeles 22, Cal.
Sundstrand Mch. Tool Co., 2531—11th St., Rockford, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

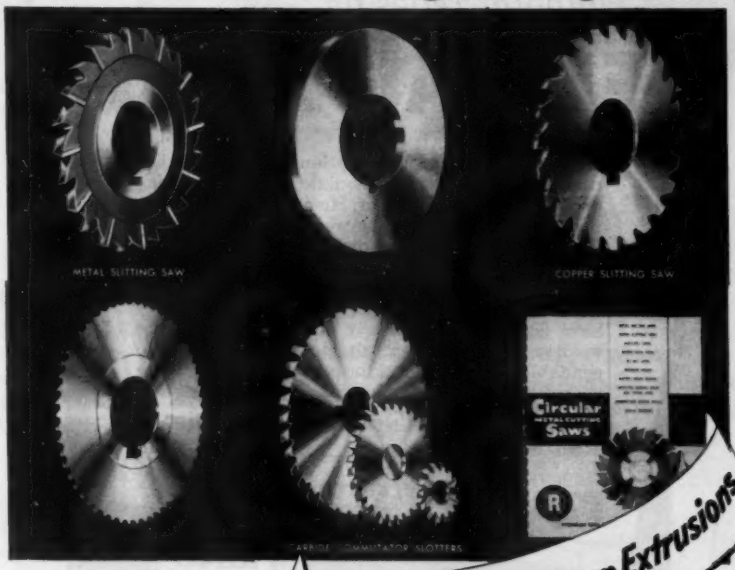
BROACHING MACHINES, Surface

Cincinnati Milling Machine Co., Special Machine Div., Marburg Ave., Cincinnati 9, Ohio
Lapointe Machine Tool Co., Hudson, Mass.
Orban, Kurt Co., Inc., 42 Exchange Place Jersey City 2, N. J.
Pioneer Broach Co., 6434 Telegraph Rd., Los Angeles 22, Cal.
Sundstrand Mch. Tool Co., 2531—11th St., Rockford, Ill.

BRONZE

American Brass Co., Waterbury 20, Conn.
Mueller Brass Co., Port Huron 35, Mich.

From More Than 1200 ® Catalog Items...



Saws for Aluminum Extrusions

394-9

CIRCLE R saws for cutting aluminum extrusions are designed for high efficiency, scientifically perfected with exclusive Circle R Heat Treating. Aluminum extrusion saws are listed among more than 1200 items in our catalog — and we also design for your special needs.

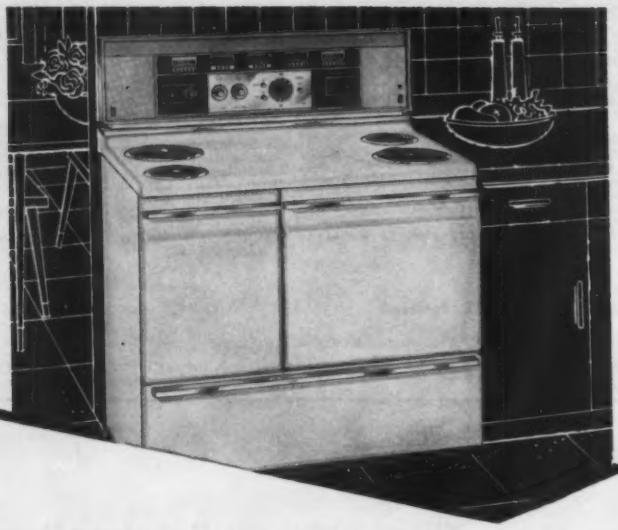
Consult a CIRCLE R *Specialist in . . .*

BURBANK
CHICAGO
CLEVELAND
DAYTON
DETROIT
HACKENSACK
INDIANAPOLIS
MEMPHIS
MILWAUKEE
MONTREAL
NEW HYDE PARK
NEW YORK CITY
PHILADELPHIA
PHOENIX
PITTSBURGH
PROVIDENCE
ROCHESTER

CIRCULAR TOOL CO., INC.
PROVIDENCE 5, RHODE ISLAND
Specialists in Circular Cutting Tools Since 1923

METAL SLITTING SAWS • COPPER SLITTING SAWS • SCREW SLOTTING SAWS • COMMUTATOR SLOTTING SAWS • JEWELERS' SLOTTING SAWS • CUT OFF SAWS • CIRCULAR KNIVES & ROTARY SHEAR BLADES • CIRCOLOY STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS • COMBINED DRILLS & COUNTERSINKS • CENTER READERS

For more data circle this page number on card at back of book



Hotpoint relies on . . .

FEDERAL-WARCO

Federal Multi-gun, combination spot and projection welders are a vital link in the exacting production schedules of Hotpoint ranges. The Federal unit shown below welds and forms range frames—adjusts to accommodate five cabinet sizes—maintains high Hotpoint volume without sacrificing quality standards.

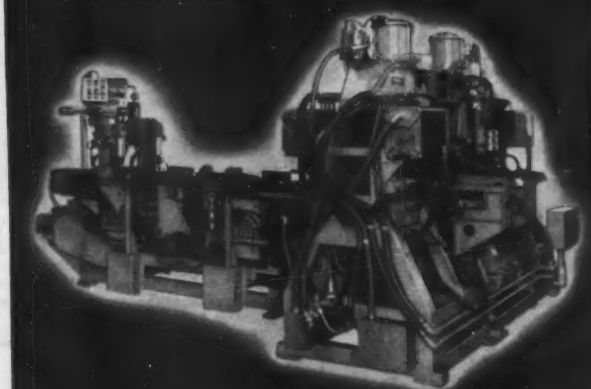
Leading metal fabricators throughout the country have learned they can rely on Federal resistance welders and Warco mechanical presses for dependable high speed performance. Precision engineered to your exact requirement by

THE FEDERAL MACHINE AND WELDER COMPANY
Warren, Ohio

Federal® WELDERS

Warco® PRESSES

Federal Multi-gun, Combination Spot and Projection Welder #58W3096A-B.



BRUSHES, Industrial, Tampico, Wire Wheel, Etc.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio

BUFFERS
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

BULLDOZERS, Metalforming
Birdsboro Corp., Birdsboro, Pa.
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Erie Foundry Co., 1253 W. 12th St., Erie, Pa.
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.

BURNISHING MACHINES
Hamilton Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.

BURRING MACHINES—See Deburring Machines

BURRS—See Files and Burrs, Rotary

BUSHINGS, Drill Jig
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Metal Carbides Corp., 6001 Southern Blvd., Youngstown 12, Ohio
Universal Engrg. Co., Frankenmuth, Mich.

BUSHINGS, Hardened Steel
Universal Engrg. Co., Frankenmuth, Mich.

BUSHINGS, Non-ferrous and Powdered Metal
Bunting Brass & Bronze Co., 715 Spencer, Toledo, Ohio
Universal Engrg. Co., Frankenmuth, Mich.

CALIPERS, Spring, Firm-Joint, Transfer, Hermaphrodite, etc.—See Layout and Drafting Tools Machinists' Small Tools

CALIPERS, Vernier
Brown & Sharpe Mfg. Co., Providence, R. I.
DoALL Co., Des Plaines, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

CAM CUTTING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Van Norman Machine Co., 3640 Main St., Springfield 7, Mass.

CAMERAS, High Speed
Wollensak Optical Co., Rochester 21, N. Y.

CAM MILLING AND GRINDING MACHINES
American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Landis Tool Co., Waynesboro, Pa.
Rowbottom Machine Co., Waterbury, Conn.

CAMS
Brown & Sharpe Mfg. Co., Providence, R. I.
Eisler Engrg. Co., Inc., 750 S. 13th, Newark 3, N. J.
Equitable Engineering, Royal Oak, Mich.
Rowbottom Machine Co., Waterbury, Conn.

CARBIDES
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.

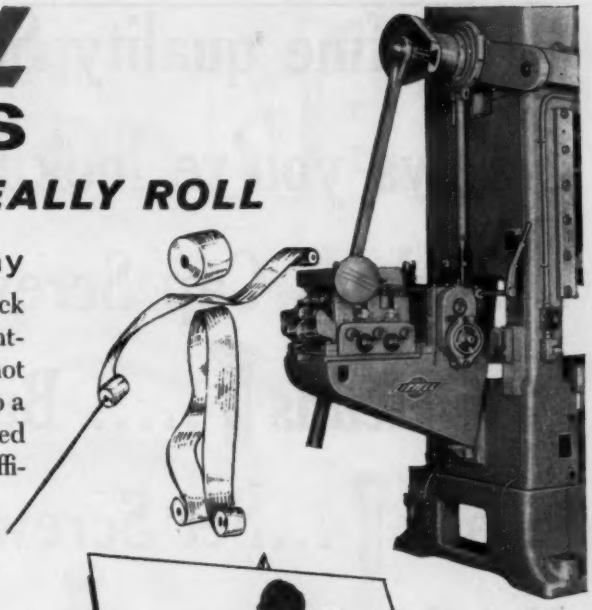
(Continued on page 258)

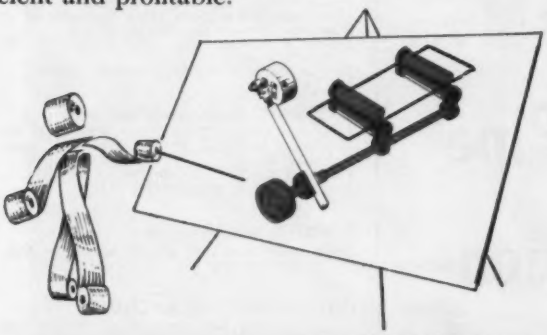
LITTELL
ROLL FEEDS

Make Press Production REALLY ROLL

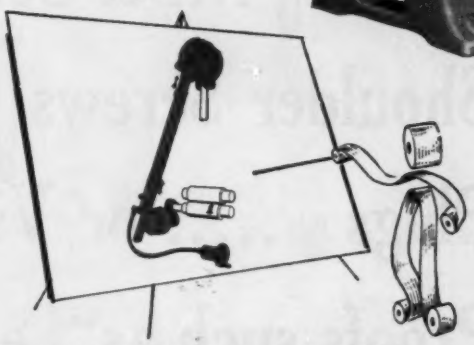
Old Pro "Coily" Points Out Why

"Coily" has been around press rooms since coil stock came into the picture. He has seen Littell Straighteners and Feeds widely copied, in design, (but not in performance) time after time. He points here to a few of the new advanced design Littell Roll Feed features that make punch press operation more efficient and profitable.

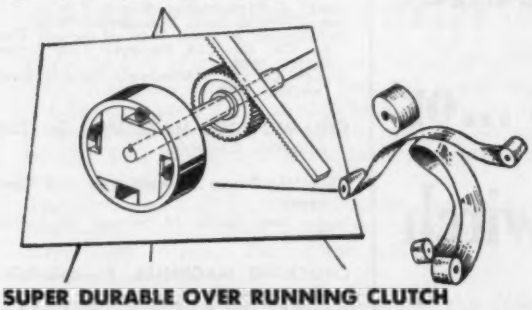




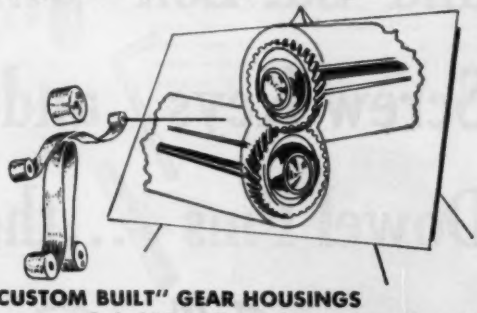
GEARS AND ROLLS ARE PRECISION CONTROLLED
Littell Rolls and Gears respond to control because they are light in weight. With less inertia to overcome, these strong, yet light rolls and gears start easy, go faster, and stop quickly. Big, new type disc brakes further assure the control that means accurate feeding in the higher speed ranges.



LITTELL MICRO RUNNING ADJUSTMENT
enables the punch press operator to adjust feed length plus or minus ⅛" while press and feed are running. A big help in setting up progressive dies requiring extremely accurate feed lengths.



SUPER DURABLE OVER RUNNING CLUTCH
Thanks to the exclusive Littell carbide cam construction that Coily points to, not a single clutch of this type has worn out in ten years of operation!



"CUSTOM BUILT" GEAR HOUSINGS
permanently hold Littell spiral gears in perfect alignment because each gear housing is specially machined for the individual spiral gears it seals in oil and protects. A Littell sustained accuracy feature.

2 New Bulletins For Punch Press Operators

Bulletin A-11
Describes Roll Feeds
For OBI Presses

Bulletin A-15
Describes Roll Feeds
For Straight Sided Presses

For free copies, address your request now.

F. J. LITTELL MACHINE CO.

4159 N. Ravenswood Ave., Chicago 13
District offices: Detroit, Cleveland

ROLL FEEDS • SHEETING LINES • STRAIGHTENING AND FEEDING MACHINES • REELS AND CRADLES FOR COIL STOCK

For more data circle this page number on card at back of book

If it's fine quality Socket Screws you're looking for ...such as Cap Screws ... Flat Heads ..... Button Heads ...Set Screws ... Shoulder Screws ...Pipe Plugs ..... or Vibration-Proofs such as "Led-Lok" and "Saf-Lok" ...or Socket Screw Keys and Kits ...or Dowel Pins ...then switch to Blue Devil®

SAFETY SOCKET SCREW COMPANY

6513 North Avondale Avenue • Chicago 31, Illinois • Telephone ROdney 3-2020

WAREHOUSES AT:
Los Angeles • Detroit
New Haven • New York City

MEMBER ASMMA

Sold only through authorized industrial distributors.

DoALL Co., Des Plaines, Ill.
Kennametal, Inc., Latrobe, Penna.
Linde Co., 30 E. 42nd St., New York 17, N. Y.
Metal Carbides Corp., Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.

CASTINGS, Die
American Brass Co., Waterbury 20, Conn.
Madison-Kipp Corp., Madison, Wis.

CASTINGS, Non-ferrous
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Mueller Brass Co., Port Huron 35, Mich.
Shenango Furnace Co., Dover, Ohio
Textile Machine Works, Reading, Penna.
Vascoloy-Ramet Corp., Waukegan, Ill.

CASTINGS—Gray Iron, Malleable
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Hill Acme Co., 1201 W. 65 St., Cleveland 2, Ohio
Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.
Malleable Castings Council, 781 Union Commerce Bldg., Cleveland 14, Ohio
Meehanite Metal Corp., New Rochelle, N. Y.
Shenango Furnace Co., Dover, Ohio
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Textile Machine Works, Reading, Penna.

CASTINGS, Steel, Stainless, etc.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Birdsboro Corp., Birdsboro, Pa.
Jessop Steel Co., Washington, Penna.

CEMENT, Abrasive Disc
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.

CENTER-DRILLING MACHINES
Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

CENTER PUNCHES—See Machinists' Small Tools

CENTERS, Grinding Machines, Indexing Head and Lathe
DoALL Co., Des Plaines, Ill.
Metal Carbides Corp., Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

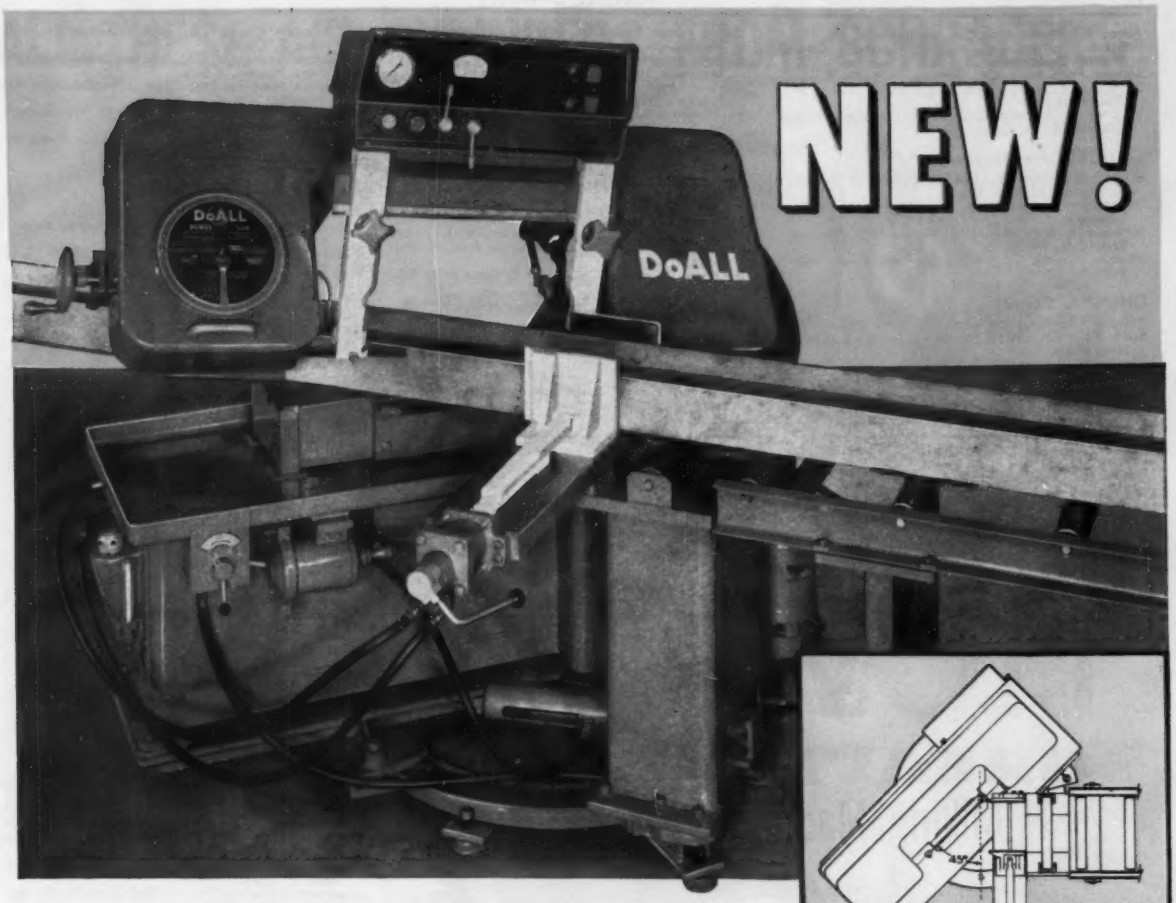
CERAMIC TOOL MATERIAL—See Tool Material, Ceramic

CHAINS, Power Transmission and Conveyor
Boston Gear Works, 14 Hayward St., Quincy 71, Mass.

CHUCKING MACHINES, Multiple-Spindle Automatic
Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.
Burg Tool and Mfg. Co., Inc., 15001 S. Figueroa, Gardena, Calif.
Cross Co., P.O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio
Wickes Mch. Tool Div., Wickes Corp., Saginaw, Mich.

CHUCKING MACHINES, Single-Spindle Automatic
Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.

(*Continued on page 260*)



ANGLE-CUTTING POWER SAW

offers faster, easier operation

With the flick of a lever you can set the new DoALL C-167A power saw for any angular cut up to 45 deg. It's quick, simple, effortless. And it takes only seconds to change back to straight cut-off work or other angles. There are no swivel vises to reset . . . no problem of swinging or loading long stock. The stock table remains fixed—only the sawing head rotates.

The sawing unit is mounted on a turntable powered from the machine's hydraulic system. Angle degree graduations on the protractor base are large, easy to read. During the cutting cycle, a positive lock holds accurate position.

The new DoALL Model C-167A power saw brings new efficiency to warehouses and production shops. Capacity at 45 deg. is 9-in. rounds, or 10-in. channels or I-beams. Also available is Model C-168A, with an automatic indexing vise which advances stock between cuts. For complete data, call your local DoALL store or write for literature.

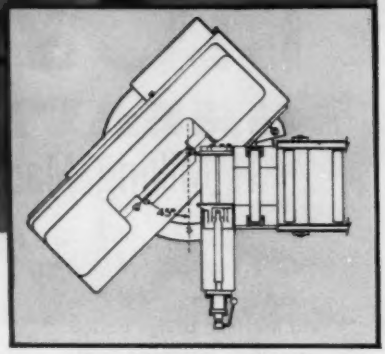
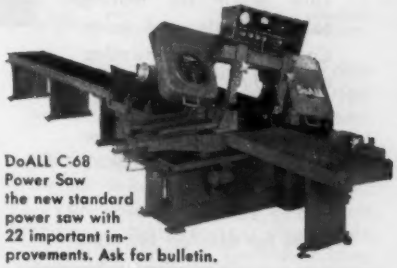


Photo shows DoALL C-167A angle power saw cutting end of 10-in. I-beam to 45-deg. angle. Sketch above shows plan view of C-167A angle power saw. Note how stock table and holding vise remain stationary while cutting head is mounted on turntable that pivots to any angle up to 45 deg. Fixed vise requires no adjustment regardless of angle being cut.



DoALL C-68 Power Saw the new standard power saw with 22 important improvements. Ask for bulletin.

PS-14

See the DoALL Exhibit in Booth 1226 ASTE Tool Show

The DoALL Company, Des Plaines, Illinois

THIS IS A TYPICAL DoALL STORE

For more data circle this page number on card at back of book

Jones & Lamson Mch. Co., Springfield, Vt.
Pratt & Whitney Co., Inc., W. Hartford, Conn. (Potter & Johnston)
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 83, Ohio

CHUCKS, Air Operated

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

CHUCKS, Collet

Bryant Chucking Grinder Co., Springfield, Vt.
Buck Tool Co., 2015 Schippers Lane, Kalamazoo, Mich.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Gorton Mch. Co., Geo., 1321 Racine St., Racine, Wis.
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Jacobs Mfg. Co., West Hartford 10, Conn.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland 14, Ohio
Universal Engrg. Co., Frankenmuth 2, Mich.
Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio
Woodworth, N. A. Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.
Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

CHUCKS, Combination Universal-Independent

Buck Tool Co., 2015 Schippers Lane, Kalamazoo, Mich.
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Geometric-Horton Div., United Greenfield Corp., New Haven, Conn.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

CHUCKS, Compensating

Buck Tool Co., 2015 Schippers Lane, Kalamazoo, Mich.
Burg Tool and Mfg. Co., Inc., 15001 S. Figueroa, Gardena, Calif.
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Logansport Mach. Co., Inc., Logansport, Ind.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.
Woodworth, N. A. Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Diaphragm

Bryant Chucking Grinder Co., Springfield, Vt.
Woodworth, N. A. Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Drill, Key Type

Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Jacobs Mfg. Co., West Hartford, Conn.

CHUCKS, Drill, Keyless

Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Jacobs Mfg. Co., West Hartford, Conn.

CHUCKS, Full Floating

Gisholt Mch. Co., Madison 10, Wis.
Universal Engrg. Co., Frankenmuth 2, Mich.

CHUCKS, Gear

Bryant Chucking Grinder Co., Springfield, Vt.
Buck Tool Co., 2015 Schippers Lane, Kalamazoo, Mich.
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Geometric-Horton Div., United Greenfield Corp., New Haven, Conn.
Woodworth, N. A. Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Independent

Buck Tool Co., 2015 Schippers Lane, Kalamazoo, Mich.
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Geometric-Horton Div., United Greenfield Corp., New Haven, Conn.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

CHUCKS, Lathe

Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Walker, O. S. Inc., Worcester, Mass.

CHUCKS, Power Operated

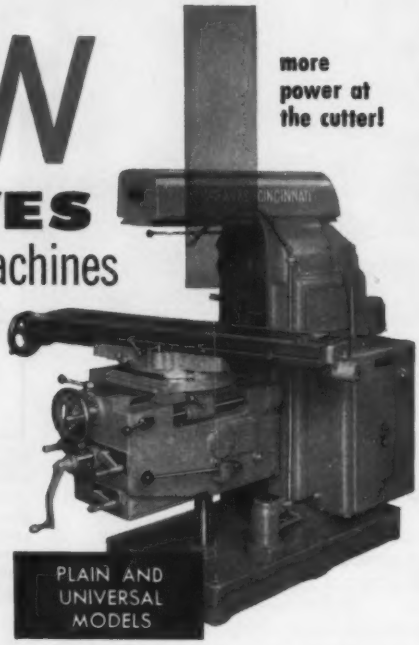
Buck Tool Co., 2015 Schippers Lane, Kalamazoo, Mich.
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Logansport Mch. Co., Inc., Logansport, Ind.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.
Woodworth, N. A. Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

new

more power at the cutter!

GREAVES

2-XH Milling Machines



PLAIN AND UNIVERSAL MODELS

The completely new GREAVES No. 2-XH Milling Machine brings added versatility, increased operational ease, and more power where it's needed most . . . *at the cutter!*

It utilizes two motors, one for spindle drive; a separate motor for moving table, saddle and knee. Compare this and the other outstanding features of the new Greaves Mill. You'll see why Greaves is "The MOST Mill for the LEAST Money."

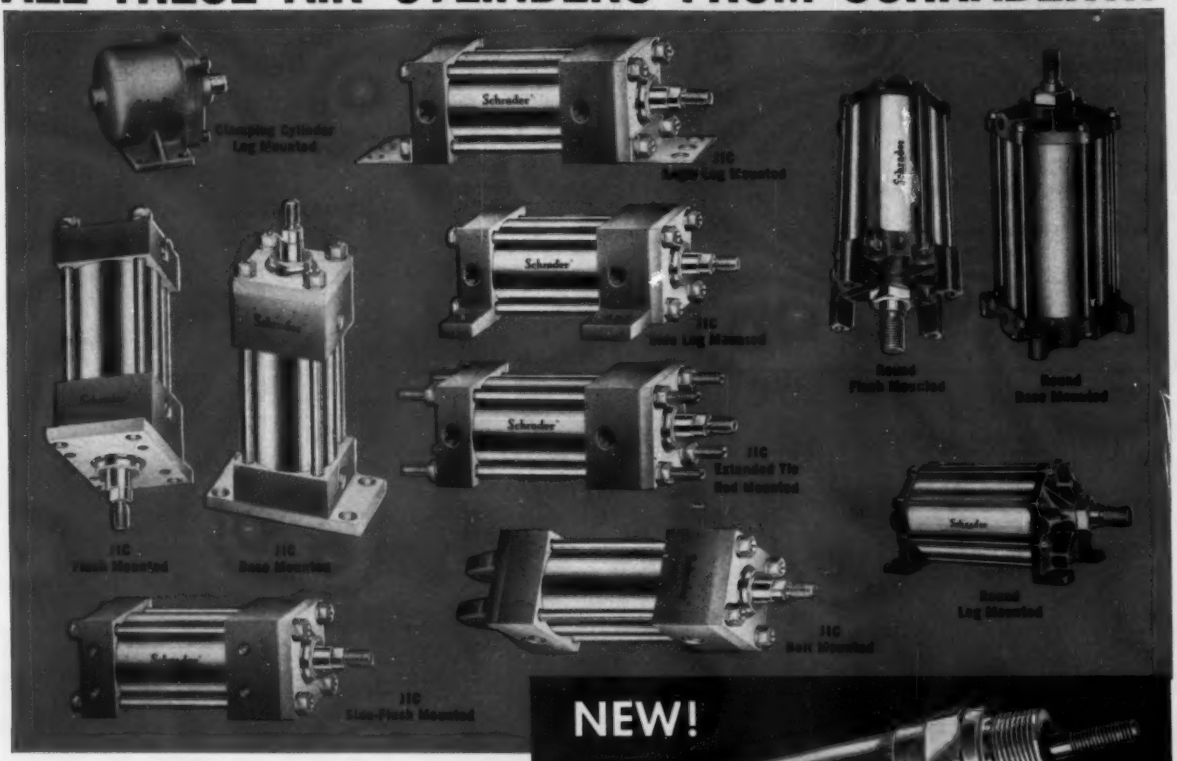
- Wide range of speed/feed combinations for any type material, any type job.
- Heavy, internally ribbed column casting and heavy duty rectangular overarm for maximum rigidity.
- Large, heavy-duty knee, saddle and table provide accuracy for all types of milling.
- New 7½ HP spindle drive motor, with separate motor for movable components, provides extra power for heavy milling.
- Easy-to-reach controls. Handwheels and vertical crank disengage automatically when not in use.
- New rapid traverse lever within operating control area.
- Separate drive motor for table, saddle and knee provides more smooth balanced power at the cutter.

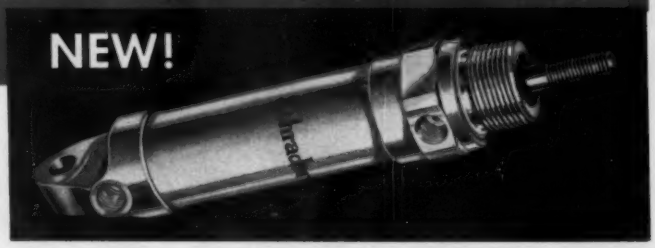
Write for detailed literature!

GREAVES

J. A. FAY & EGAN COMPANY
2500 Eastern Avenue, Cincinnati 2, Ohio

ALL THESE AIR CYLINDERS FROM SCHRADER...



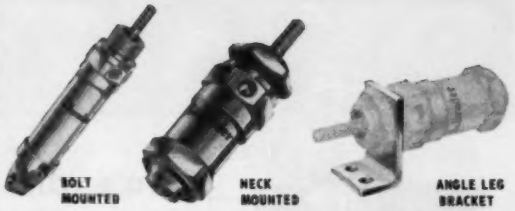


Schrader offers complete lines of double-acting and single-acting air cylinders in 9 bore sizes, with or without cushioned strokes, including JIC cylinders, all in a variety of mountings. They make hard work easy . . . provide powerful push, pull, lift or reciprocating movements . . . and are at work by the thousands in countless plants everywhere.

...AND NOW...POWERFUL NEW MIDGET AIR CYLINDERS

Here they are! Streamlined, compact air cylinders for light duty and gang-type applications . . . rugged . . . only slightly thicker than your thumb! Schrader makes them with strength and precision that will give long trouble-free service even in tough applications requiring extra stamina and speed. Simple to use in any position. Excellent for operating jigs and fixtures, transfer and special purpose machines. Features: No tie rods . . . double-acting . . . popular 1" bore . . . stroke sizes to 12".

Your Schrader distributor is fully stocked with all these air cylinders. He is staffed with factory-trained experts who are fully qualified to help you solve any air control problem and select the right air components to perform jobs best. You'll find him in the yellow pages, or write direct.



Schrader's new midget air cylinders have quality built in . . . cartridge type bronze bearing and piston rod seal . . . non-corrodible solid brass end plates with hexagonal flats and non-corrodible brass cylinder and pistons . . . ground and polished steel piston rod . . . molybdenum disulphide grease packing . . . synthetic rubber "U" cup piston seals.

Schrader
a division of SCOVILL

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
454 Vanderbilt Avenue, Brooklyn 38, N. Y.

QUALITY AIR CONTROL PRODUCTS

For more data circle this page number on card at back of book

CHUCKS, Quick Change and Safety
Burg Tool and Mfg. Co., Inc., 15001 S. Figueroa, Gardena, Calif.
Jacobs Mfg. Co., West Hartford 10, Conn.
Universal Engrg. Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping
Jacobs Mfg. Co., West Hartford, Conn.

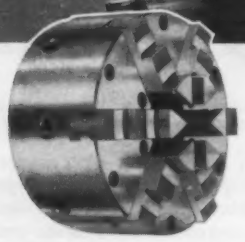
CHUCKS, Universal Three-Jaw
Buck Tool Co., 2015 Schippers Lane, Kalamazoo, Mich.
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Geometric-Horton Div., United Greenfield Corp., New Haven, Conn.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Logansport Mch. Co., Inc., Logansport, Ind.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.
Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio

CHUCKS, Wrenchless
Gisholt Machine Co. 1209 E. Washington Ave., Madison 10, Wis.

CLAMPS, "C", Toggle, Toolmakers' Parallel—See Set-Up Equipment

CLEANERS, Metal
Oakite Products, Inc., 26 Rector St., New York, N. Y.

CLUTCHES
Cleveland Punch & Shear Works Co. 3817 St. Clair Ave., Cleveland 14, Ohio
Minster Mch. Co., Minster, Ohio
Wichita Clutch Co., Wichita Falls, Texas



The original 6-jaw chuck...

Buck originated the 6-jaw Ajust-Tru® chuck and, though others have tried, none can equal the Buck in precision with speed.

Here's why...

You save labor time. Any experienced chuck operator can adjust the Buck to dead true precision *within one minute!*

You save re-chucking time. The *exclusive* Buck Ajust-Tru® principle *guarantees .0005" precision* chucking duplicate parts.

You save replacement costs. The Buck automatically compensates for wear to give you far longer precision work-holding than obsolete design chucks—*yet cost no more!*

Send for catalog. See why, in *every* way —"It pays to chuck with Buck."

Makers of Scroll, Power, Dust Proof, Independent Chucks.

TOOL SHOW—BOOTH 821

BUCK TOOL COMPANY
420 SCHIPPERS LANE • KALAMAZOO, MICHIGAN

COIL CRADLES
Rowe Machinery & Mfg. Co., Inc., Dallas, Texas

COLD HEADING
National Machinery Co., Tiffin, Ohio
Waterbury Farrel Foundry & Mach. Co., Waterbury, Conn.

COLLETS—See Chucks, Collet

COMBINATION SQUARES—See Machinists' Small Tools

COMPARATORS, Dial, Electronic and Air
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Sheffield Corp., Box 883, Dayton 1, Ohio

COMPARATORS, Optical
DoALL Co., Des Plaines, Ill.
Eastman Kodak Co. Rochester, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt
Opto-Metric Tools, Inc., 137 Varick St., New York 13, N. Y.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning—See Cleaners, Metal

COMPOUNDS, Cutting, Grinding, Metal Drawing, etc.—See Cutting and Grinding Fluids

COMPRESSORS, Air
Chicago Pneumatic Tool Co., New York 17, N. Y.
Wilson, K. R. Inc., Arcade, N. Y.

COMPUTERS, Digital
Bendix Computer Div., Bendix Aviation Corp., 5630 Arbor Vitae St., Los Angeles 45, Calif.

CONTOUR FOLLOWERS—See Tracing Attachments

CONTRACT WORK
Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Eisler Engrg. Co., 750 S. 13th St., Newark 3, N. J.
Equitable Engineering, Royal Oak, Mich.
Erie Foundry Co., 1253 W. 12th St., Erie, Penna.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Root, R. M., Co., York, Pa.
Textile Machine Works, Reading, Pa.
Van Keuren Co. 176 Waltham St., Watertown 72, Mass.

CONTROLLERS
Allen-Bradley Co., 1331 S. 1st St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

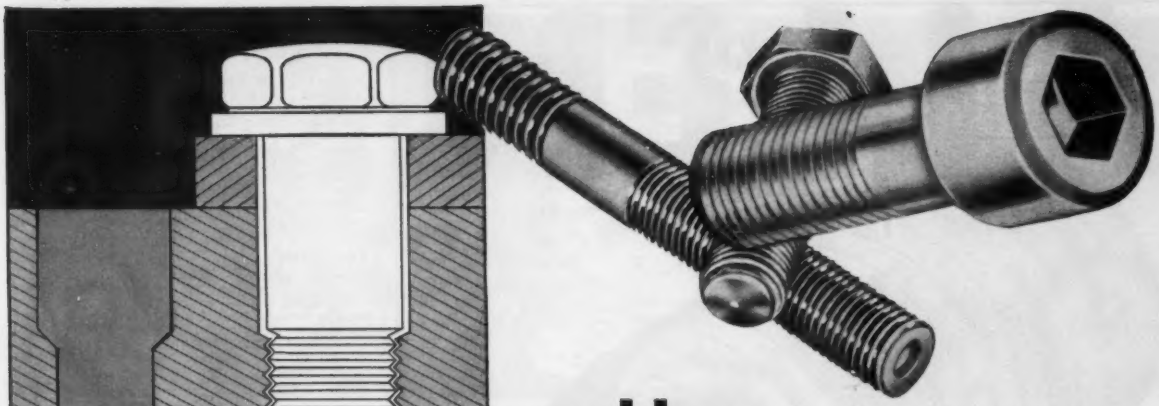
CONTROL SHAFTS—See Lead-screws & Splines, Ball Bearing

CONVEYORS FOR DUST, CHIPS, ETC.
Barnes, W. F. & John Co., Rockford, Ill.

COOLANTS—See Cutting & Grinding Fluids

COPPER
American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

COUNTERBORES AND COUNTERSINKS
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio



Typical cavities produced by Mohawk Standard, two-diameter Sublands of the Drill-Drill type.

problem:

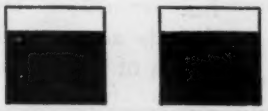
Having tap drill or body clearance problems with bolts and screws? Simply eliminate the problem, stop tap breakage, speed production and reduce tool inventories the easy way. Here's the . . .

solution:

MOHAWK STANDARD SUBLAND DRILLS

Mohawk Standard Sublands of the Drill-Drill type will produce clean, concentric, burrless holes in *one* simple operation. Thus, you automatically eliminate extra jigs, fixtures, tap breakage and poorly fitted parts. And, a Mohawk Standard will out-perform and outlast dozens of ordinary tools because they stay accurate through regrinds...right down to the shank! You get more holes per hour at lower cost per hole than ever before. Mohawk Standards are the time-proved solution for more efficient, cost-saving drilling operations.

MOHAWK STANDARDS are immediately available from factory and local stocks in three basic types: Subland Drill Chamfer, Subland Drill-Counterbore and Subland Drill-Drill. In all practical sizes, three standard step lengths and three shank styles.



Subland Drill-Chamfer | Subland Drill-Counterbore

Write Today **for your free copy of the new Mohawk Standard Catalog. Complete with detailed illustrations and specifications on the full line of cost-saving Standard Subland Drills.**

world's largest producer of Sublands

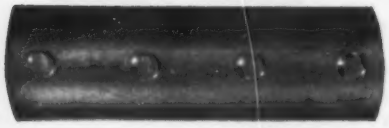
Mohawk TOOLS, INC.
Montpelier, Ohio

For more data circle this page number on card at back of book

ALLEN

Allenpoint's deep, full-circle bite assures tremendous resistance to removal torque! Stays tighter longer!

When you need a set screw that you can depend on to stay tight under heavy strain and vibrations, specify ALLENPOINT. Here's why you can always depend on ALLENPOINT: proper design of the cup diameter results in a rugged grip that makes the full-circle pattern you see here... deep, strong, clean sockets allow full wrenching leverage... and uniform Class 3A threads assure a tight friction lock over the entire length of Allenpoint Set Screws.



Ask your ALLEN Distributor for samples and full engineering details—he's always ready, willing, and able to give you prompt, practical service!

5 ANNIVERSARY YEAR ALLEN HEAD 1910-1960

ALLEN MANUFACTURING COMPANY

HARTFORD 1, CONNECTICUT, U.S.A.

Cogsdill Tool Drill Co., Greenfield, Mass.
DoALL Co., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Mohawk Tools, Inc., Montpelier, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland 14, Ohio
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Wesson Co., 1200 Woodward Heights Blvd., Detroit 20, Mich.

COUPLINGS

Birdsboro Corp., Birdsboro, Pa.
Boston Gear Works, 14, Hayward St., Quincy 71, Mass.
Mueller Brass Co., Port Huron, Mich.
Schrader's Sons, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.
Walker Co., Inc., O. S., Rockdale St., Worcester, Mass.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio

CUTTERS, Keyseating

Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
DoALL Co., Des Plaines, Ill.
Mitts & Merrill, 1009 So. Water St., Saginaw, Mich.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.

CUTTERS, Milling

Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill. (end mills).
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio
DoALL Co., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorton, George, Mch. Co., 1321 Racine St., Racine, Wis.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Kennametal, Inc., Latrobe, Penna.
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Motch & Merryweather Mchy. Co., 888 E. 70th St., Cleveland 3, Ohio
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland 14, Ohio
Tomkins-Johnson Co., Jackson, Mich.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.

CUTTING AND GRINDING FLUIDS

Cincinnati Milling Machine Company, Cincinnati Milling Products Div., Marburg Ave., Cincinnati 9, Ohio
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Johnson, S. C. & Son, Inc., Racine, Wis.
Oakite Products, Inc., 26 Rector St., New York 6, N. Y.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 Fifth Ave., New York, N. Y.
Stuart, D. A. Oil Co., Ltd., 2727 S. Troy St., Chicago 23, Ill.
Texaco, Inc., 135 E. 42nd St. New York 17, N. Y.

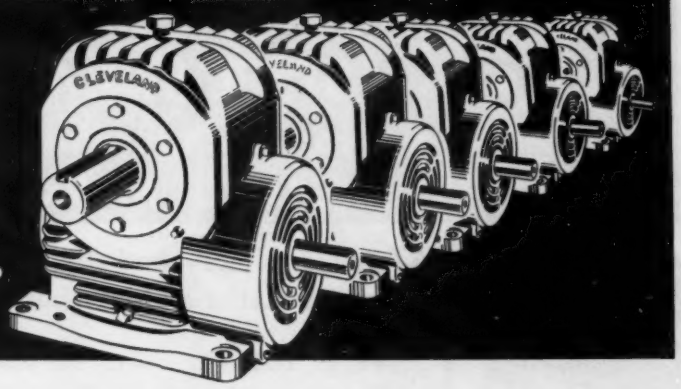
CUTTING-OFF MACHINES, Lathe Type

Bardons & Oliver, Inc., 1133 W. Ninth St., Cleveland 13, Ohio
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Modern Machine Tool Co., Jackson, Mich.

CUTTING-OFF SAWS, Abrasive Wheel

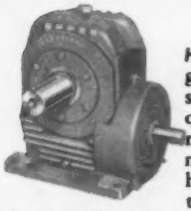
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Johnson Manufacturing Co., Albion, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Ty-Sa-Man Machine Co., Inc., 1093 White Ave., Knoxville, Tenn.
Wallace Supplies Mfg. Co., 1310 W. Diversey Parkway, Chicago 14, Ill.

Why do these new Clevelands carry higher horsepower ratings?



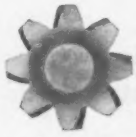
It's because Cleveland design engineers — drawing on 47 years of experience — have successfully blended the *just right* combination of housing design, exclusive heat-treatment for alloy steel worms, centrifugal casting of bronze gear rims together with larger, more rugged taper roller bearings on worm and gear shafts.

This permits substantially higher horsepower ratings with smaller worm and gear units — units that more than meet AGMA's new Standard 440.03. Cleveland now offers speed reducers — from one to forty horsepower — at savings of 50% or more on cost per horsepower.



HOUSING is a rugged one-piece design of highest quality cast iron, ribbed for maximum strength and heat dissipation. Cooling fan of unique design is mounted on *input* end of worm shaft and is equally efficient in either direction of rotation. Only one gear shaft bearing plate is large enough to permit assembly of the gear. On gear shaft extension side, gear shaft bearing is mounted in the housing bore and backed up by a clamping plate. This gives a stronger housing and provides maximum strength for overhung loads. Housings are designed for mounting in one position only, thus avoiding design compromises necessary with *universal mount* types.

BEARINGS on both worm and gear shafts are Timken taper roller-type, providing adequate thrust and radial capacity. Worm bearings are mounted directly in housing bore for greater rigidity.



WORMS are cut integral with shaft and accurately ground to a high surface finish on both thread flanks. Shaft extension diameter is especially large to permit increased overhung load capacity. An exclusive heat-treating technique provides a high degree of hardness throughout the entire thread thickness and well below the worm's root diameter. It gives maximum thread strength and resistance to wear without losing the advantage of a tough core of medium hardness.

GEARS have centrifugally cast bronze rims with a high tin-nickel content. They provide greater density and a higher hardness, giving increased resistance to wear and fatigue pitting. Bronze rims are centrifugally cast integral with cast iron centers, in smaller sizes up to 6 inches, which permits strong mechanical keying of the two parts — without dependence on actual surface bond. Gear shaft extension diameters are especially large to permit greatly increased overhung load capacity.

ORIGINAL MASTER WORMS for each size and ratio of worm gearing, are made individually in Cleveland's tool room to extremely close tolerances and kept in perpetual stock. Cleveland makes all their hobs. No outside source has been found that can produce worm gear hobs to their exacting tolerances and standards. Each hob is checked against this master worm — as are production worms and gears. Thus, it's not necessary to ever replace Cleveland worms and gears in sets. A new gear will operate perfectly with an old worm and vice versa.

Call your Cleveland Representative today, to get all the facts on these new, more powerful speed reducers. Or, write for a copy of new, free Bulletin No. 405 giving complete engineering information.

CLEVELAND
Worm Gear
Speed Reducers

Cleveland Worm & Gear Division
Eaton Manufacturing Company
3276 East 80th Street • Cleveland 4, Ohio

For more data circle this page number on card at back of book

Specify PANNIER STEEL STAMPS for a longer life of CLEANCUT MARKING

29,335 hammer blows—and still marking cleanly—Pannier Letter and Number Stamps

Rounded corners for finger comfort
Rounded head distributes impact, reduces mushrooming.
Type size Identification
Added metal in Pannier fillet increases durability. Correct bevel gives clearer impression, longer life. Outside bevel longer than inside for protection of character face.

Made of the finest tool steel and correctly heat treated for best combination of hardness and toughness, Pannier single character stamps can take it! Scientific shaping and accurate engraving insure a long life of good, clear impressions. Available in letters, figures and special symbols, and in light, medium or heavy duty design.

Extra tough steel forging stamps for hot or cold, heavy duty marking

For stamping names, part or patent numbers, trade marks and similar markings, Pannier forging stamps are made in four styles:—Hand-style, fullered for wire handle and wood handle style with eye parallel or perpendicular to lettering. All are designed and heat treated for clear impressions and long service. All are covered by the Pannier Master Marker guarantee.

Supreme Holders with "Roto-Pin" for quick, easy number change

An easy, half-turn flip for Roto-Pin releases any or all of the steel type for fast change. A reverse flip locks them in perfect alignment.

Roto-Pin makes this Pannier Master Marker a time saver in number change and makes serial number marking fast and efficient. The hardened anvil at the base of the type slot keeps type in perfect alignment for equal impression. Machined from bar tool stock, the Supreme Holder has a heat treated striking head. Both anvil and striking head are replaceable for longer life of the holder itself. Made in hand or wood handle styles, for hot or cold marking.

Write for literature

BIRTHMARKED MATERIALS

MARKING MASTER PANNIER MARKERS DEVICES

THE PANNIER CORPORATION

819 PANNIER BUILDING PITTSBURGH 12, PA.

Offices: Los Angeles • Cleveland • Chicago • Philadelphia • Birmingham

PANNIER MASTER MARKERS FOR QUALITY

CUTTING TOOLS—See Tool Material

CYLINDERS, Air

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.
Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio
Logansport Mch. Co., Inc., Logansport, Ind.
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Wilson, K. R., Inc., Arcade, N. Y.

CYLINDERS, Hydraulic

Barnes, John S., Corp., 301 S. Water St., Rockford, Ill.
Chicago Pneumatic Tool O., New York 17, N.Y.
Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio
Logansport Mch. Co., Inc., Logansport, Ind.
Tomkins-Johnson Co., Jackson, Michigan
Vickers Inc., Administrative & Engineering Center, Box 302, Detroit 32, Mich.
Wilson, K. R., Inc., Arcade, N. Y.

DEBURRING MACHINES

Barber-Colman Co., 1300 Rock St., Rockford, Illinois
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Orban Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Box 893, Dayton 1, Ohio
Wallace Supplies Mfg. Co., 1310 W. Diversey Parkway, Chicago 14, Ill.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Crucible Steel Co. of America, P. O. Box 2518 Pittsburgh 30, Pa.

DIAMONDS, Industrial

Engelhard Industries, Inc., 113 Astor St., Newark 2, N. J.

DIE CASTINGS—See Casting, Die

DIE CASTING MACHINES

B & T Machinery Co., Rockford, Ill.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.

DIE CUSHIONS

Bliss, E. W. Co., 1375 Raft Rd., S. W., Canton, Ohio
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Danly Machine Specialties, Inc., 2100 South Laramie, Chicago 50, Ill.
Minster Machine Co., Minster, Ohio
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.

DIEING MACHINES

Pratt & Whitney Co., Inc., W. Hartford, Conn.

DIE INSERTS, Carbide

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Kennametal, Inc., Latrobe, Penna.
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Vascoloy-Ramet Corp., Waukegan, Ill.

DIE SETS AND DIEMAKERS' SUPPLIES

Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Danly Machine Specialties, Inc., 2100 South Laramie, Chicago 50, Ill.
Producto Mch. Co., 985 Housatonic Ave., Bridgeport 1, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, E. Orange, N. J.
Wales-Strippit, Inc., Akron, N. Y.

DIE SINKING MACHINES—See Milling Machines, Die Sinking, etc.

Flange diameter: 106 inches

No less impressive: body diameter is 96 inches, and bore diameter is 75 inches. This main cylinder stands 115¾ inches high, and weighs 103,300 pounds. Made of molybdenum-vanadium steel, we heat-treated and tested it before shipping to our customer. By now, it's been finish-machined and is hard at work in a hydraulic press.

Incidentally, the same order called for three other cylinders, one bolster, and four tie rods. These pieces ranged in weight from 22,000 pounds to 113,000 pounds. Bethlehem forged and machined them all as specified, and delivered them on time.

RIGHT ON THE NOSE. Our shops will meet your specifications *exactly* on all types of press, drop, and hammer forgings, regardless of size or design.

BETHLEHEM STEEL COMPANY BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

DIE STOCKS—See Stocks and Dies

DIES, Blanking, Forming, Drawing, Extruding, etc.

Cincinnati Shaper Co., P. O. Box 111, Cincinnati 11, Ohio
Metal Carbides Corp., Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport 7, Conn.
Niagara Mch. & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Ryerson & Son, Inc., Jos. T., 16th & Rockwell St., Chicago 8, Ill.
Vascoloy-Ramet Corp., Waukegan, Ill.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.
Wales-Strippit, Inc., Akron, N. Y.

DIES, Lettering and Embossing

Wales-Strippit, Inc., Akron, N. Y.

DIES, Self-opening Threading

Consolidated Mch. Tool Div., 565 Blossom Rd., Rochester 10, N. Y.
Greenfield Tap & Die Corp., Greenfield, Mass.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.

DIES, Thread Cutting—See Stocks and Dies

DIES, Thread Rolling

Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Reed Rolled Thread Die Co., Holden, Mass.
Sheffield Corp., Box 893 Dayton 1, Ohio.

DIE STEELS

Jessop Steel Co., Washington, Pa.

DISINTEGRATORS

Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Elox Corp. of Michigan, Troy, Mich.

DIVIDERS AND TRAMMELS—See Layout and Drafting Tools

DIVIDING HEADS—See Indexing and Spacing Equipment

DOWEL PINS

Allen Mfg. Co., Bloomfield, Conn.
Danly Machine Specialties, Inc., 2100 South Laramie, Chicago 50, Ill.
Producto Machine Co., 985 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, E. Orange, N. J.

DRAWING COMPOUNDS

Oakite Products Inc., 26 Rector St., New York 6, N. Y.
Stuart, D. A. Oil Co., Ltd., 2727 S. Troy St., Chicago 23, Ill.

DRESSERS, Grinding Wheel

DoALL Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio.
Metal Carbides Corp., Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Standard Tool Co., 3950 Chester Ave., Cleveland 14, Ohio

DRIFT KEYS

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
DoALL Co., Des Plaines, Ill.

DRILL HEADS, Multiple Spindle

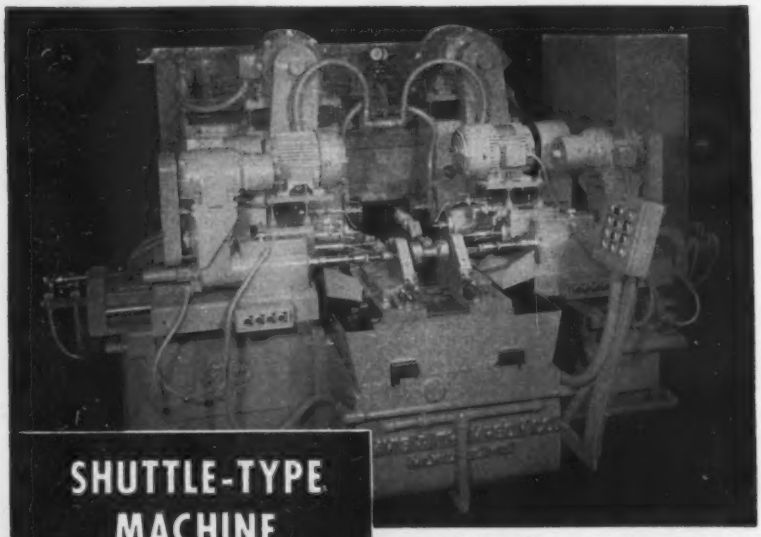
Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 15 Wason Ave., Springfield 1, Mass.
Buffalo Forge Co., 390 Broadway, Buffalo, N. Y.
Burg Tool and Mfg. Co., Inc., 15001 S .Figueroa, Gardena, Calif.
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Cross Co., P. O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Jarvis Corp., Middletown, Conn.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Lamb, F. Joseph Co., 5664 E. Nine Mile Rd., Detroit 34, Mich.
Leland Gifford Co., Box 989, Worcester 1, Mass.
National Automatic Tool Co., Richmond, Ind.
Root, B. M., Co., York, Pa.
Snyder Corp., 3400 E. Lafayette Ave., Detroit 7, Mich.
Thriftmaster Products Corp., 1014 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio
Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Snow Manufacturing Co., Bellwood, Illinois

DRILL SLEEVES AND EXTENSION HOLDERS

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
DoALL Co., Des Plaines, Ill.
Greenfield Tap & Die Corp. Greenfield, Mass.
National Automatic Tool Co., Inc., S. 7th & N St., Richmond, Ind.
National Twist Drill & Tool Co., Rochester, Mich.



SHUTTLE-TYPE MACHINE HANDLES OVER 40 DIFFERENT VALVE PARTS

. . . Mills, Centers, Tap Drills and Taps in #316 Stainless

Here's a good example of engineering a semi-standard machine to handle a lot of parts. Although this machine has been adapted to milling, centering, drilling and tapping of valve parts, its basic design lends itself to other operations through the addition of various types of heads as well as multiple spindle drill heads. Machine incorporates hydraulic controls for table feed and index, two milling heads, two hydraulic power heads, each with center drill and tap drill spindle, and two mechanical screw feed tapping heads to accommodate 16, 20 and 24 pitch threads. Capacities range from ⅜" to 4½" diameter, 5" to 23" long. Parts are inner valves for liquid level controls of tough #316 stainless steel.

If you need high production of one part or moderate production of many parts *with a minimum capital outlay*, it will pay you to call in a D & T production engineer. There is no obligation for this service.

FREE DATA

Write for Bulletin 1002.

Roto-Matic

Davis and Thompson Co.

4460 N. 124th ST. . . . MILWAUKEE 18, WISCONSIN

DRILLING ATTACHMENTS, Multiple Spindle—See Drill Heads, Multiple Spindle, and Vises, Machine

DRILLING AND BORING UNITS, Self-contained

Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Barnes, W. F. & John Co., Rockford, Ill.
Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.
Buhr Machine Tool Co., 839 Green St., Ann Arbor, Mich.
Burg Tool and Mfg. Co., Inc., 15001 S. Figueroa, Gardena, Calif.
Cross Co., P. O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.
Kaukauna Machine & Foundry Div., Biddings & Lewis Machine Tool Co., Kaukauna, Wis.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Leland-Gifford Co., Box 989, Worcester 1, Mass.
National Automatic Tool Co., S. 7th and N Sts., Richmond, Ind.
Olivetti Corp. of America, 42-33 Northern Blvd., Long Island City 1, N. Y.
Sheffield Corp., Box 893, Dayton 1, Ohio
Snyder Corp., 3400 E. Lafayette Ave., Detroit 7, Mich.
Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

DRILLING MACHINE FEEDS, Hydraulic

Beckett-Harcum Co., Wilmington, Ohio

DRILLING MACHINES, Automatic

Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., Rockford, Ill.
Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport 5, Conn.
Buhr Machine Tool Co., 839 Greene St., Ann Arbor, Mich.
Burg Tool and Mfg. Co., Inc., 15001 S. Figueroa, Gardena, Calif.
Cross Co., P. O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.
Davis & Thompson Co., 4460 N. 12th St., Milwaukee 10, Wis.
Edlund Mchry. Co., Div., Cortland, N. Y.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Leland-Gifford Co., Box 989, Worcester 1, Mass.
Moline Tool Co., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Olivetti Corp. of America, 42-33 Northern Blvd., Long Island City 1, N. Y.
Snow Manufacturing Co., Bellwood, Ill.
Snyder Corp., 3400 E. Lafayette Ave., Detroit 24, Mich.
Wales-Strippit, Inc., Akron, N. Y.
Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

DRILLING MACHINES, Bench

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Burgmaster Corp., 15001 S. Figueroa, Gardena, Calif.
Cincinnati Lathe & Tool Co., 3207 Disney St., Cincinnati 9, Ohio
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Div., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio
Hamilton Tool Co., 834 9th St., Hamilton, Ohio
Leland-Gifford Co., Box 989, Worcester, Mass.
Olivetti Corp. of America, 42-33 Northern Blvd., Long Island City 1, N. Y.

DRILLING MACHINES, Deep Hole

Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.
Berthiez, Charles, 5 Rue Montalivet, Paris, France
Burg Tool and Mfg. Co., Inc., 15001 S. Figueroa, Gardena, Calif.
DoALL Co., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., Box 989, Worcester 1, Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Wales-Strippit, Inc., Akron, N. Y.

DRILLING MACHINES, Gang, Multiple-spindle

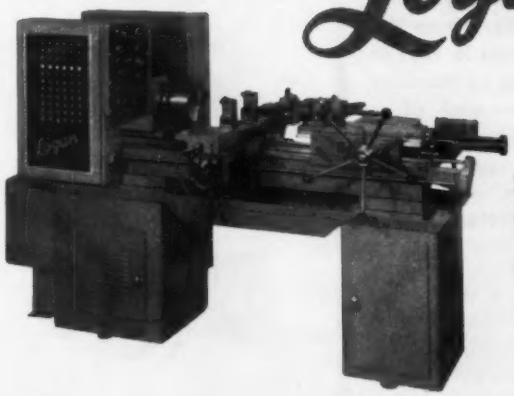
Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., Rockford, Ill.
Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport 5, Conn.
Buhr Machine Tool Co., 839 Green St., Ann Arbor, Mich.
Burgmaster Corp., 15001 S. Figueroa, Gardena, Calif.
Burg Tool and Mfg. Co., Inc., 15001 S. Figueroa, Gardena, Calif.
Cincinnati Bickford Div., Oakley, Cincinnati, Ohio
Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 4460 124th St., Milwaukee 10, Wis.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Div., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio
Greenlee Bros. & Co., 136 12th St., Rockford, Ill.
Hamilton Tool Co., 834 So. 9th St., Hamilton, Ohio
Ingersoll Milling Machine Co., 505 Fulton Ave., Rockford, Ill.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Leland-Gifford Co., Box 989, Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Olivetti Corp. of America, 42-33 Northern Blvd., Long Island City 1, N. Y.
Root, B. M., Co., York, Pa.
Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

DRILLING MACHINES, Radial

American Tool Works Co., Pearl & Eggleston Ave., Cincinnati, Ohio
Burg Tool and Mfg. Co., Inc., 15001 S Figueroa, Gardena, Calif.
Carlton Mch. & Tool Co., 2961 Meeker St., Cincinnati 25, Ohio
Cincinnati Bickford Div., Oakley, Cincinnati, Ohio
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio

(Continued on page 270)

NEW! LOGAMATIC "450" BY Logan

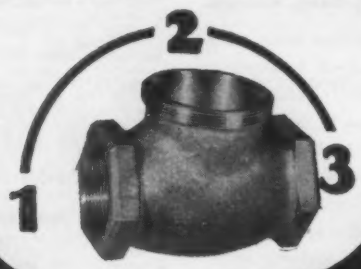


SEE IT AT THE ASTE SHOW BOOTH 1830 APRIL 21-28

A newly developed, automated turret lathe, the *Logamatic "450"*—with 14-inch swing and 1⅝-inch spindle hole—puts profit in short or long production runs with an ease, accuracy and flexibility not previously in its price range. . . . See this versatile performer *in operation* at Detroit's Artillery Armory, April 21-28, during your visit to the ASTE Convention!

FOR MORE INFORMATION about the new Logamatic "450", drop a line to:

LOGAN ENGINEERING CO., Dept. K-460, 4901 Lawrence Ave., Chicago 30, Illinois

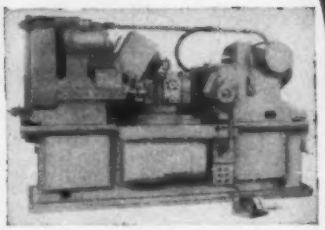


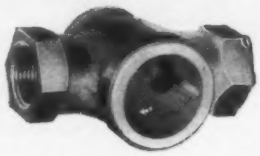
...and parts are finished without rehandling on

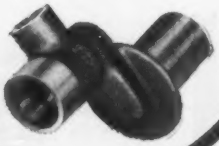
GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & De Leeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & De Leeuw and only Goss & De Leeuw offers this feature in a standard chucking machine.







A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A

Cincinnati Lathe & Tool Co., 3207 Disney St., Cincinnati 9, Ohio
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., Cleveland 14, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio

DRILLING MACHINES, Sensitive
Baker Brothers, Inc., 1000 Post Ave., Toledo 10, Ohio
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Burgmaster Corp., 15001 S. Figueroa, Gardena, Calif.
Burg Tool and Mfg. Co., Inc., 15001 S. Figuera, Gardena, Calif.
Cincinnati Bickford Div., Oakley Cincinnati, Ohio
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Div., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock St., Cincinnati 23, Ohio
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio
Leland-Gifford Co., Box 989, Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Olivetti Corp. of America, 42-33 Northern Blvd., Long Island City 1, N. Y.
Wales-Strippit Inc., Akron, N. Y.

DRILLING MACHINES, Universal Radial
Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.

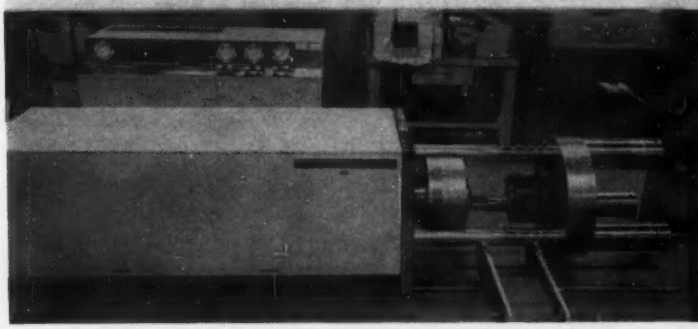
DRILLING MACHINES, Upright
Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Barnes, W. F. & John Co., Rockford, Ill.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Burgmaster Corp., 15001 S. Figueroa, Gardena, Calif.
Burg Tool and Mfg. Co., 15001 S. Figueroa, Gardena, Calif.
Cincinnati Bickford Div., Oakley, Cincinnati, Ohio
Cincinnati Lathe & Tool Co., 3207 Disney St., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Wales-Strippit, Inc., Akron, N. Y.

DRILLS, Center
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Circular Tool Co., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio
Cogsdill Twist Drill Co., Greenfield, Mass.
DoALL Co., Des Plaines, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland 14, Ohio
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.

DRILLS, Core
Ace Drill Corp., Adrian, Mich.
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
DoALL Co., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Mohawk Tools, Inc., Montpelier, Ohio
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland 14, Ohio
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.

EVIDENCE

▶▶ *Here is clear evidence that high velocity extrusion of metal has dispersed stringy non-metallic inclusions. The part pictured is a hinge pin for* USAF's *B-58 Hustler. The pin on the left was machined from* AISI *4335 modified bar stock. The clearly visible inclusions made the part unfit for service. The pin at the right is made from the same material, but only after it had been extruded at very high velocities by a* DYNAPAK *machine. The inclusions have been eliminated. The part is completely satisfactory. There is no need to change to a more costly metal, or to resort to special mill heats.*



Pneumatically energized DYNAPAK, a product of General Dynamics Corporation, is industry's first practical tool for high-energy-rate metalworking. Many industries are now adapting DYNAPAK to the solution of forging, forming, and extrusion problems. The experience of Convair Fort Worth with these hinge pins gives evidence of another of DYNAPAK's advantages.

for complete information, write, wire, or phone:

DYNAPAK

CONVAIR / A DIVISION OF GENERAL DYNAMICS CORPORATION

1243 Transit Avenue, Pomona, California • Phone: NAtional 3-1561

For more data circle this page number on card at back of book

DRILLS, Deep Hole, Gun
Ace Drill Corp., Adrian, Mich.
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Eldorado Tool & Mfg. Corp., Milford, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.

DRILLS, Oil Hole, Oil Tube
Chicago Heights Steel Co., Chicago Hts., Ill.
Chicago-Latrobe, 411 Ontario St., Chicago 10, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
DoALL Co., Des Plaines, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.

DRILLS, Portable Electric
Chicago Pneumatic Tool Co., New York 17, N.Y.

DRILLS, Portable pneumatic
Buckeye Tools, Corp., Dayton, Ohio
Chicago Pneumatic Tool Co., New York 17, N. Y.
Cleco Air Tools Div., Reed Roller Bit Co., Houston, Tex.

DRILLS, Ratchet
Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 46, Ill.
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
Standard Tool Co., 3950 Chester Ave., Cleveland 14, Ohio

DRILLS, Subland
Ace Drill Corp., Adrian, Mich.
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
DoALL Co., Des Plaines, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Mohawk Tools, Inc., Montpelier, Ohio
National Twist Drill & Tool Co., Rochester, Mich.

DRILLS, Twist, High-Speed Steel, Carbon Steel
Ace Drill Corp., Adrian, Mich.
Chicago Heights Steel Co., Chicago Hts., Ill.
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Cleveland Twist Drill Co., 1242 49th St., Cleveland 14, Ohio
DoALL Co., Des Plaines, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Mohawk Tools, Inc., Montpelier, Ohio
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Threadwell Tap & Die Co., 16 Arch, Greenfield, Mass.

DRILLS, Twist, Carbide, Carbide-Tipped
Ace Drill Corp., Adrian, Mich.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
DoALL Co., Des Plaines, Ill.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Threadwell Tap & Die Co., 16 Arch, Greenfield, Mass.

DRILLS, Wire
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio
Cogsdill Twist Drill Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland 14, Ohio

DUPLICATING ATTACHMENTS—See Tracing Attachments

DUST COLLECTORS AND CONTROL SYSTEMS
Brown & Sharpe Mfg. Co., Providence, R. I.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Pangborn Corp., Hagerstown, Md.
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 14, Ohio

ELECTRICAL DISCHARGE MACHINES
—See Disintegrators

ELECTRONIC CONTROL SYSTEMS
Hughes Products, International Airport Station, Los Angeles 45, Calif.
Micro-Path Inc., 10321 Anza, Los Angeles 45, Cal.
Reliance Electric & Engrg. Co., 1200 Ivanhoe Rd., Cleveland 10, Ohio
Stromberg-Carlson Div., General Dynamics Corp., 1493 N. Goodman St., Rochester 3, N. Y.

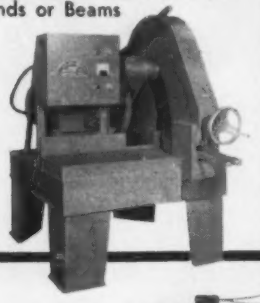
ENGRAVING MACHINES
Casa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mach., 1321 Racine St., Racine, Wis.

EXTRACTORS, Screw
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
Greenfield Tap & Die Corp., Greenfield, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

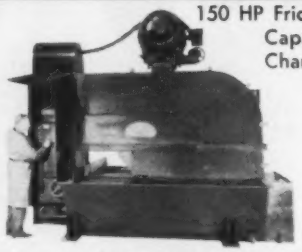
FACING HEADS
Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Cross Co., P.O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.
Davis Boring Tool Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.
Mummert-Dixon Co., Hanover, Pa.

Ty-Sa-Man America's Most Complete Line of Industrial Sawing Machinery

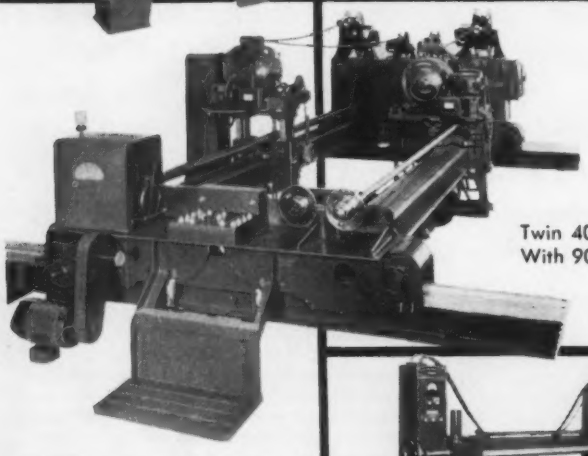
30 HP Chop Saw, Capacity 8" Rounds or Beams



150 HP Friction Saw Capacity 24" Channel

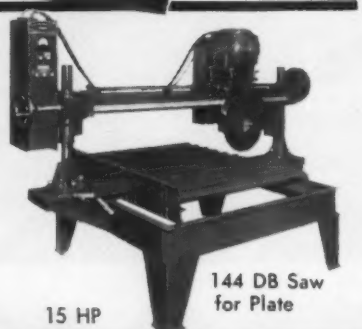


75 & 40 HP Model Available



Twin 40 HP Gantry With 90° Swivel Heads

If you can't cut it with a standard saw . . . call us! Ty-Sa-Man has built thousands of special and standard saws, one of which may solve your problem. If not, our engineering staff is at your disposal.



144 DB Saw for Plate

15 HP

TY-SA-MAN
MACHINE COMPANY, Inc.
1093 White Avenue
Knoxville 1, Tennessee

Write Today for Free Brochure
A brochure pictures and describes the functions of many metal saws. If you have a cutting problem, write or call today.

Accurate threads!

Longer tool life!

STANDARD TAPS

Maintain Accuracy to produce Correct Class of Fit because:

Flutes are Automatically Index Ground insuring Uniform Flute Spacing, Flute Contours and Chamfers.

STANDARD'S Surface treatments have been developed to increase tool life when tapping highly abrasive materials.

STANDARD Furnishes Taps specifically designed for use in cast iron, zinc, plastics, aluminum, stainless, and other applications.

STANDARD'S
Authorized Distributors Stock-ready for immediate delivery—the COMPLETE FAMILY OF STANDARD QUALITY CUTTING TOOLS,
Twist Drills ... Reamers ... Taps ... Dies ... Milling Cutters ... End Mills ... Counterbores ... Hobs ... Carbide Tools and Gages.

Take advantage of STANDARD'S experience and know-how in metallurgy and engineering for your metal cutting problems.

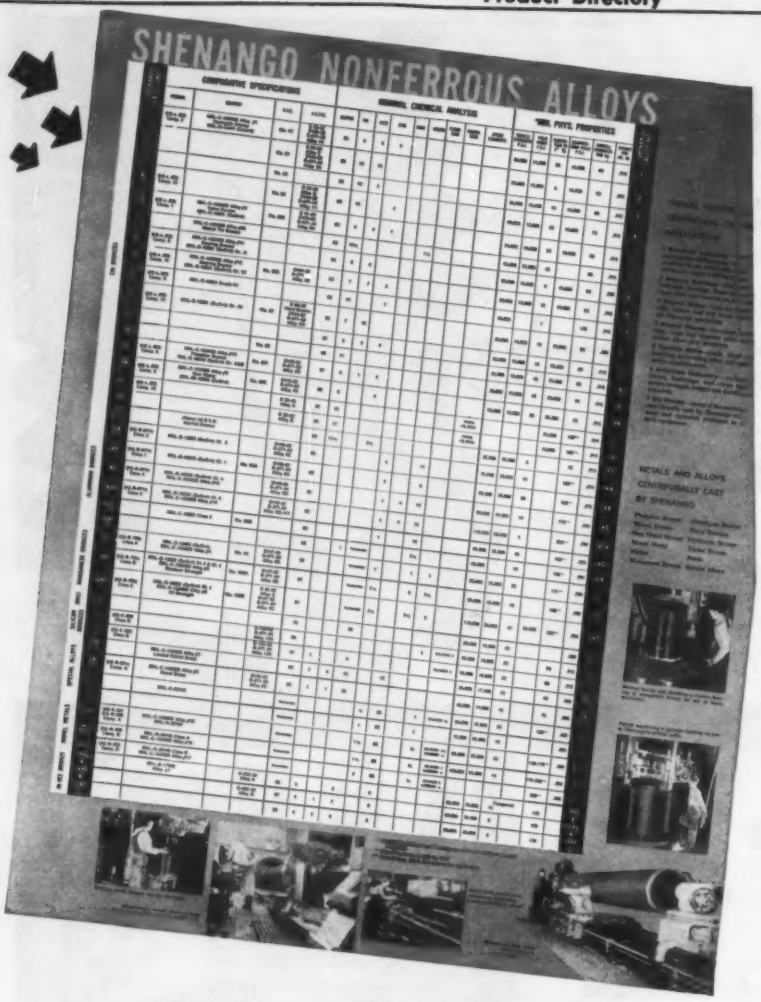
Call the STANDARD Distributor in your area.

STANDARD TOOL CO.

3950 CHESTER AVENUE CLEVELAND 14, OHIO

BRANCH WAREHOUSES IN: NEW YORK · DETROIT · CHICAGO · DALLAS · LOS ANGELES · SAN FRANCISCO

For more data circle this page number on card at back of book



HERE'S A HELPFUL AND CONVENIENT REFERENCE SOURCE

for ***COMPARATIVE SPECIFICATIONS***
CHEMICAL ANALYSES
MINIMUM PHYSICAL PROPERTIES

...clearly charted in SHENANGO'S new Bulletin No. 157

This invaluable chart of nonferrous alloys centrifugally cast by Shenango is readily available upon request. For your free copy, write to this publication or the Centrifugally Cast Products Division, The Shenango Furnace Company, Dover, Ohio.

SHENANGO CENTRIFUGAL CASTINGS

COPPER, TIN, LEAD, ZINC BRONZES · ALUMINUM AND MANGANESE BRONZES
MONEL METAL · NI-RESIST · MEEHANITE METAL · ALLOY IRONS · DUCTILE IRON

FANS, Exhaust, Ventilating
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

FASTENERS
Allen Mfg. Co., Bloomfield, Conn.
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FEEDERS, Automatic
Detroit Power Screwdriver Co., 2799 W. Fort St., Detroit 16, Mich.
Gear-O-Mation Div., Michigan Tool Co., 7171 McNichols Rd., Detroit 12, Mich.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.

FILES, Band
DoALL Co., Des Plaines, Ill.

FILES, General-purpose, Swiss Pattern
DoALL Co., Des Plaines, Ill.

FILES AND BURRS, Rotary
DoALL Co., Des Plaines, Ill.
Jarvis Corp., Middletown, Conn.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FILING MACHINES
Chicago Pneumatic Tool Co., New York 17, N. Y.
DoALL Co., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS, Coolant and Oil
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Cuno Engineering Corp., Meriden, Conn.
Marvel Enginering Co., 7227 N. Hamlin Ave., Chicago 45, Ill.
U. S. Hoffman Machinery Corp., Syracuse, N.Y.

FLAME-HARDENING MACHINES
Cincinnati Milling Machine Co., Meta-Dynamics Div., Marburg Ave., Cincinnati 9, Ohio
Gleason Works, 1000 University Ave., Rochester 3, N. Y.

FLEXIBLE SHAFT EQUIPMENT
Jarvis Corp., Middletown, Conn.

FORGING HAMMERS, Steam and Air
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., 1253 W. 12th St., Erie, Penna.

FORGING MACHINES, Headers, Upsetters, Presses
Ajax Mfg. Co., 1441 Chardon Rd., Cleveland 17, Ohio
Bliss, E. W. Co., 1375 Raff Rd. S. W. Canton, Ohio
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
National Machinery Co., Tiffin, Ohio
Waterbury Farrel Foundry & Mch. Co., Waterbury, Conn.

FORGINGS, Drop
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORGINGS, Hollow-Bored
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Mueller Brass Co., Port Huron 35, Mich.

FORGINGS, Press
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., Cleveland 14, Ohio

(Continued on page 276)

PRECISION Quarterly NUMBER 2

PRECISION WELDER AND FLEXOPRESS CORPORATION, 3520 Ibsen, Cincinnati 9, Ohio

STAMPING RECORDS TOPPLE

Husky Flexopresses combine speed and accuracy to turn out cookware and "cookies" at unprecedented stamping rates.

★ *Manitowoc, Wis.* – An aluminum manufacturer is attacking rising costs with an "automatic weapon – peacetime style." it's a 50-ton Flexopress, owned by Mirro Aluminum Company, who declares it is "ripping out machine-gun rates of 680 component parts per minute,"–and shot the photograph above to prove it.

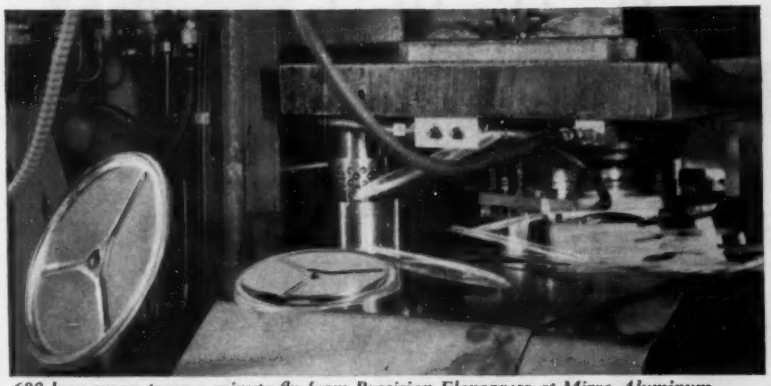
This is music to our ears, here at Precision Welder and Flexopress Corporation. And the Mirro news came right on the heels of record breaking news in the electric motor industry.

★ *Cookie Cutter* – In January, we shipped a 100-ton vertical Flexopress to a Michigan manufacturer of electric motors. He's using it to punch the slots and holes in 0.025 inch thick silicon steel "cookies" at a rate of 300 per minute. That's three times as fast as those silicon steel rotor laminations have ever been punched before.

Think what this advantage means to other motor manufacturers who can triple their production rates and cut costs, too. We know it can be done with Flexopresses. That press we shipped to Michigan punched 345 cookies per minute on its trial run and is *guaranteed* for 250 per minute.

★ *Ball Bearings* – Look closely at a Flexopress and you'll see why it does such jobs so swiftly and accurately. The ram rolls on preloaded ball bearing raceways (a patented Flexopress exclusive). They make every Flexopress a truly precision machine tool, no pun intended. The pre-loaded slides *don't even need clearance for lubrication.* When a press builder guarantees squareness of ram to bed to half a thousandth at any speed and stroke, that's precision, capital P or lower case.

Along about now, when you're thinking what presses like these could do for you, is just the time to call in the Flexopress sales representative and get the facts – fast and accurate.



680 lazy susan trays a minute fly from Precision Flexopress at Mirro Aluminum Company, Manitowoc, Wisconsin. (Actual stroboflash photo.)

Imaginative Handling = Profitable Presses

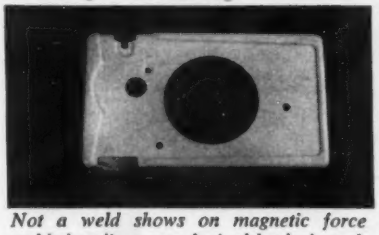
THE SUBTLE difference between a fine fast press and a fine fast press making a profit is precise material handling. This is why Precision has become expert at creating devices to get the stock in and the parts out as fast as Flexopresses can operate (and that can be awfully fast!).

Recently we put on our material handling hat for a really imaginative manufacturer. He wants a line that starts with a 40-inch mill coil of steel and ends with stampings big as an auto instrument panel stamped and stacked on pallets at a rate of 80 a minute. He's going to get it, too.

This really fantastic story can't be told–yet. But Precision is constantly building all sorts of other accurate and dependable devices to feed its presses. Flexofeed, for example (feed rate up to 2500 inches per minute, stroke up to 36 inches, accuracy to plus or minus 0.002 inch). Such devices share the credit for Flexopress records.

VINYL MARKET AWAKENS

MANUFACTURERS ARE just beginning to discover how much the warmth, texture and color of vinyl clad steel can enhance their products. Especially, they like the way this new material can be formed first, and then welded *without a welding mark showing.*



Not a weld shows on magnetic force welded radio case of vinyl-backed steel.

Precision Magnetic Force welding equipment does this tricky job, working from the back (bare) side of the metal. The welding current travels in and out of the same metal face and never touches the coating at all!

Automobile trim, radio cabinets, metal furniture, business machine frames, sports equipment – you're going to see a lot more of this sort of thing with the look and feel of leather, and the strength of hidden weld construction. When you do, look for a Precision welder behind the seams.

Possibly you missed–

These objective articles about other Precision developments:

- ☐ European Foil Butt Seam Welding Process Comes to U. S., **American Machinist,** June 30, 1958
- ☐ Automatic Welding – Forming, **Production,** November, 1958
- ☐ Where Stamping and Assembly Meet, **Steel,** June 18, 1956

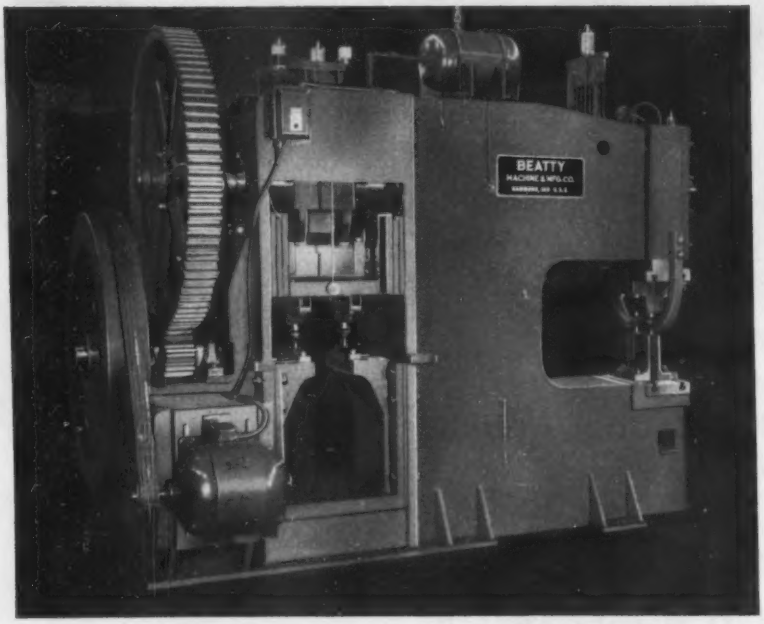
Or want more information about these:

- ☐ Precision Magnetic Force Welders
- ☐ Precision High Speed Flexopresses

Check off what you want and let us know. We'll oblige.

For more data circle this page number on card at back of book

When Will ONE Machine Do The Work of THREE?



WHEN IT'S A BEATTY DETAIL BEAM PUNCH

Here's a real cost-saver that punches I-beams in just three passes instead of the usual five, and further speeds production by eliminating the end-for-end turning of beams. Many shops require three ordinary machines to do the work which can be handled by one Beatty Detail Beam Punch. This punch not only saves floor space, but also reduces your equipment investment. High dies in the open throat portion punch webs of beams, angles, channels and plates. Punch tools in overhanging bolsters in the guillotine portion punch holes in flanges on either side of the webs of beams. Write for complete details.

SPECIFICATIONS — No. 7 Detail Beam Punch. Capacity: 100-tons or punching 1¼" hole through 1" mild steel.
WEB PUNCH END: Face of Ram, 6" x 18" — Face of Table, 6" x 18" — Distance ram to table, stroke up, 21¾" — Length of Stroke, 1¾" — Depth of Throat, 30". FLANGE PUNCH END: Opening through frame, 26" — Length of stroke, 2" — Distance ram to table, stroke up, 12".

TOOL EQUIPMENT: WEB PUNCH END — One set single gag punch tools for punching plates, angles, webs of beams, channels and shapes. FLANGE PUNCH END — Two sets of single gag punch units suitable for punching flanges of beams and channel sections.

Punch units for both ends are of the drop stem type for locating the punch in proper position.

ONE OF THE BEATTY FAMILY OF METAL WORKING EQUIPMENT: Shears, Punches, Presses, Spacing Tables, Bulldozers, Stamping Trimmers

BEATTY MACHINE & MFG. CO.
941 150th St., Hammond, Indiana

Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Minster Mch. Co., Minster, Ohio
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York 17, N. Y. (die-pressed)

FORGINGS, Upset
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.

FORMING MACHINES, Cold Rolling
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Michigan Tool Co., Mount Gilead, Ohio
Niagara Mch. & Tool Wrks, 637 Northland Ave., Buffalo, N. Y.
Yoder Co., 5500 Walworth, Cleveland, Ohio

FORMING MACHINES, Multiple-slide
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
U. S. Tool Co., Inc., 255 North Main St., Ampere, E. Orange, N. J.

FORMING TOOLS or Tool Blanks
Brown & Sharpe Mfg. Co., Providence, R. I.
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

GAGE BLOCKS
Brown & Sharpe Mfg. Co., Providence, R. I.
DoALL Co., Des Plaines, Ill.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GAGES, Air Comparator
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., Box 893, Dayton 1, Ohio

GAGES, Automatic Sorting
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Box 893, Dayton 1, Ohio

GAGES DIAL, Bore, Height, Depth, Thread, Groove, etc.
Ames, B. C. Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Cadillac Gage Co., P. O. Box 3806, Detroit, Mich.
DoALL Co., Des Plaines, Ill.
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
General Electric Co., Schenectady, N. Y.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Scherr, George Co., Inc., 200 Lafayete St., New York 12, N. Y.

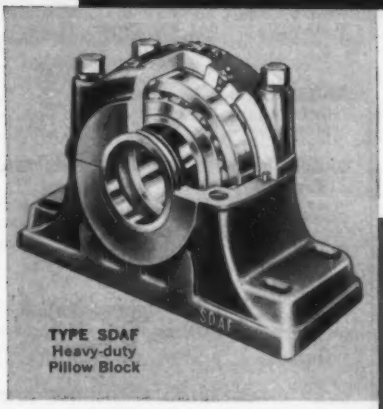
GAGES, Electric Comparator
Airborne Instruments Laboratory, Huntington Station, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoALL Co., Des Plaines, Ill.
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
General Electric Co., Schenectady, N. Y.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Box 893, Dayton 1, Ohio

GAGES, Grinding
Equitable Engineering, Royal Oak, Mich.
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Box 893, Dayton 1, Ohio

GAGES, Machinists' Hand, including Center, Cutter Clearance, Drill Point, Drill Size, Planer, Radius, Screw Pitch, Taper Telescoping Thickness
(*Continued on page 278*)

TYPE SAF
Ball or Spherical Roller
Bearing Pillow Block

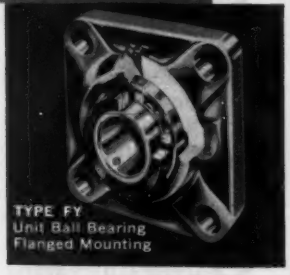
Can you get these "special" qualities in "standard" pillow blocks?



TYPE SDAF
Heavy-duty
Pillow Block

TYPE SY
Unit Ball Bearing
Pillow Block

TYPE SES
Unit Rubber-flex Ball
Bearing Pillow Block



TYPE FY
Unit Ball Bearing
Flanged Mounting

Most pillow blocks offer easy assembly and rugged housings. But can they offer you low friction, self-aligning bearing operation and efficient sealing as well?

They can—if they're the SKF pillow blocks, and flanged mounting, shown here. Type SAF, for example, comes equipped with low-friction ball or spherical roller bearings that are *inherently* self aligning. And these bearings are effectively protected by Triple-Seal rotating rings. Abrasives and corrosives can't get to them—oil or grease can't drip out.

Yet this is a standard SKF pillow block, that is competitively priced in spite of its combination of extra features. We make it for shaft sizes from ¾" to 10½", for mounting directly or with an adapter. A cast steel housing (SAFS) is available for heavy duty applications.

For details, call one of our twenty-five offices. 5938

Spherical, Cylindrical, Ball, Timken® Tapered and REED Miniature Bearings

EVERY TYPE—EVERY USE

SKF®

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

*REG. U.S. PAT. OFF.

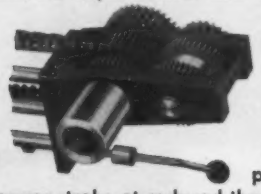
For more data circle this page number on card at back of book

*Anything you need
in a **drill press feed . . .**

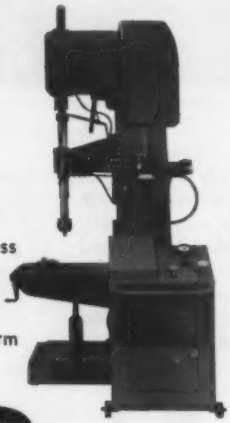
BECKETT HAS IT!

***ELECTRICALLY CONTROLLED AIR FEEDS. Drilling and Drilling-Tapping Models.** Beckett electrically controlled feeds provide proper thrust and correct drilling/tapping action for work in almost any material. Drilling-tapping models will tap direct from drill chuck, eliminating tapping heads, clutches, leadscrews, etc. Standard duty model has 2½" stroke and 740 lbs. max. thrust; heavy-duty model has 4" stroke and 1250 lbs. max. thrust, on 1¼" pinion shaft at 100 psi air pressure.

***MECHANICALLY (manually) CONTROLLED AIR FEED for drilling operations** has same sensitive drilling action as electric feeds. Action is controlled by manually activating precision Beckett Hi-Cyclic Air Valve. Standard and heavy-duty models have same stroke and max. thrust as electric models described above. Super-accurate depth control and automatic dwell.



***GEARED HEAD AIR FEEDS. Mechanically or electrically controlled.** Beckett Geared Air Feeds provide either greater drill point thrust with shorter stroke, or a longer stroke at reduced thrust, than the feeds described above, *without adding to length of power transmission arm.* Outside gears are pick-off type and interchangeable. Stroke and thrust can range from 8" stroke at 625 lbs. max. thrust, to 2" stroke at 2500 lbs. max. thrust, on 1¼" pinion shaft at 100 psi.



***HYDRAULIC FEEDS FOR AUTOMATING LARGER DRILL PRESSES.**
Here is a complete hydraulic power package that can be *tailored* to your drill presses and your work requirements. Drill point thrust in excess of 5000 lbs. is obtainable on most equipment, as are approach speeds of 1" per sec. Feed speed is infinitely variable. Unit consists of heavy-duty power transmission arm and portable console housing control valves, hydraulic pump and tank.

GET FULL DETAILS TODAY.
WRITE FOR NEW CATALOG FM-60.

NFPA NATIONAL FLUID POWER ASSOCIATION MEMBER

BECKETT-HARCUM CO.

987 W. LOCUST STREET, WILMINGTON, OHIO

Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

GAGES, Multiple Inspection
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Box 893, Dayton 1, Ohio
Woodworth, N. A. Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GAGES, Plug and Ring
Brown & Sharpe Mfg. Co., Providence, R. I.
DoALL Co., Des Plaines, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., Box 893, Dayton 1, Ohio
Threadwell Tap & Die Co., 16 Arch, Greenfield, Mass.
Van Keuren Co., 176 Waltham St., Watertown 72, Mass.
Winter Bros. Co., Rochester, Mich.
Woodworth, N. A. Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GAGES, Roll, Thread, Snap
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Box 893, Dayton 1, Ohio
Threadwell Tap & Die Co., 16 Arch, Greenfield, Mass.

GAGES, Surface Roughness
DoALL Co., Des Plaines, Ill.
Sheffield Corp., Box 893, Dayton 1, Ohio

GAGES, VERNIER, Height, Depth, Gear Tooth
Brown & Sharpe Mfg. Co., Providence, R. I.
DoALL Co., Des Plaines, Ill.
Equitable Engineering, Royal Oak, Mich.
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.

GEAR BURNISHERS
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Sheffield Corp., Box 893, Dayton 1, Ohio

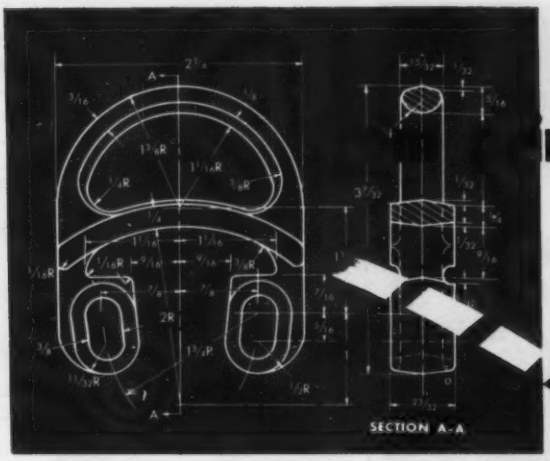
GEAR CHAMFERING ROUNDING AND DEBURRING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Cross Co., P. O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Sheffield Corp., Box 893, Dayton 1, Ohio

GEAR CHECKING EQUIPMENT
Brown & Sharpe Mfg. Co., Providence, R. I.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Equitable Engineering, Royal Oak, Mich.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Bevel and Spiral
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Worm and Worm Wheels
Barber-Colman Co., 1300 Rock St., Rockford, Ill.

(Continued on page 280)



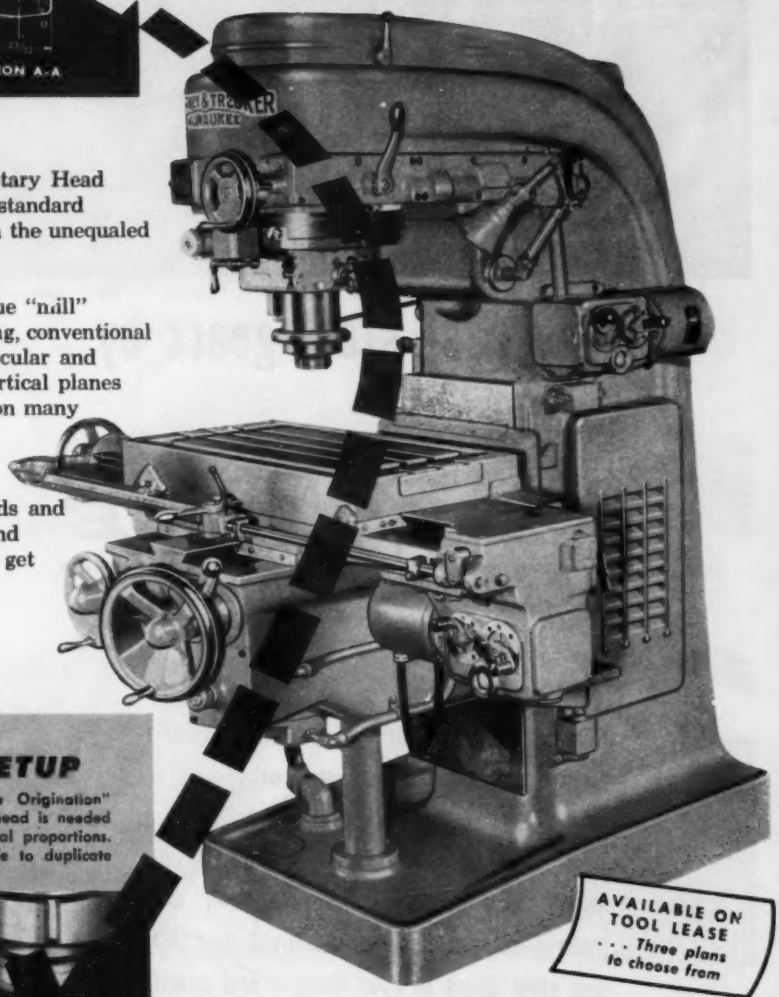
nt to finished product in a single setup

. . . WITHOUT TEMPLATES AND TRACING EQUIPMENT

The Kearney & Trecker Model D Rotary Head Milling Machine is the most *versatile* standard machine tool in existence today — with the unequaled bonus of *accuracy* to tenths.

The rotary head design of this unique "mill" permits precision boring, drilling, slotting, conventional vertical milling, and the milling of circular and angular cuts in both horizontal and vertical planes with the simplest of setups — in fact on many jobs, such as the one illustrated below, only a single setup is required.

If you're machining tools, dies, molds and other parts requiring multiple radii and extremely close tolerances, be sure to get all the facts on the Model D Rotary Head Milling Machine.



AVAILABLE ON TOOL LEASE . . . *Three plans to choose from*

BRASS DIE COMPLETED IN ONLY ONE SETUP

A new machining principle called "Multiple Origination" provides that only one setting of the rotary head is needed to handle one or more operations of identical proportions. After the head is set, merely move the table to duplicate the preset machining motion exactly.

Call your local Kearney & Trecker representative or write today and ask for the Model D Literature File.

KEARNEY & TRECKER MILWAUKEE ®

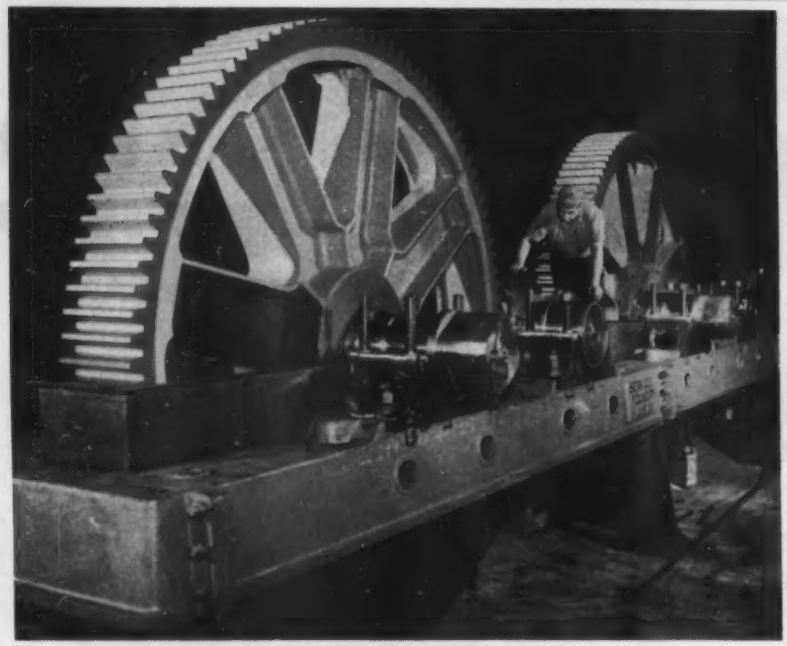
Standard Machinery Division

KEARNEY & TRECKER CORP.

6800 W. NATIONAL AVE. • MILWAUKEE 14, WIS.

(Phone GReenfield 6-8300...Direct Distance Dialing Code 414)

For more data circle this page number on card at back of book



large cast steel gears by

SERVICE FOUNDRY

Service Foundry Division of Avondale manufactures cast steel gears (plain or alloyed) up to 16'-1½" outside diameter and 30" face. Teeth are cut without limitation as to tooth form or size on a Gleason gear planer. Cast tooth gears are also manufactured. For large cast steel gears to your designs and specifications—contact Service Foundry.

VERSATILE BUILDER ON THE MISSISSIPPI

AVONDALE
MARINE WAYS, INC.
Service Foundry Division
416 ERATO ST. • JAckson 2-3836 • NEW ORLEANS 13, U.S.A.

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Scherr, George Co., Inc., 200 Lafayete St., New York 12, N. Y.

GEAR GRINDERS—See Grinding Machines, Gear

GEAR HOBBERS
American Schiess Corp., 1232 Penn. Ave., Pittsburgh 22, Pa.
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

GEAR HONERS
National Broach & Mch. Co., 5600 St. Jean, Detroit 13, Mich.

GEAR LAPPERS
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. Nichols Rd., De- Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean, Ave., Detroit 13, Mich.

GEAR MOTORS—See Speed Reducers

GEAR RACKS
Equitable Engineering, Royal Oak, Mich.
Illinois Gear & Mch. Co., 2108 N. Natchez Ave., Chicago 5, Ill.
Stahl Gear & Mch. Co., The, 3901 Hamilton Ave., Cleveland 4, Ohio

GEAR SHAPERS
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Lapointe Machine Tool Co., Hudson, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

GEAR SHAVERS
Fellows Gear Shaper Co., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean, Ave., Detroit 13, Mich.

GEARS, AND GEAR BLANKS, Nonmetallic
Boston Gear Works, 14 Hayward St., Quincy 71, Mass.
Cincinati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio
Diefendorf Gear Corp., Box 934, Syracuse, N. Y.
Equitable Engineering, Royal Oak, Mich.
Greaves Machine Tool Co., 2011 Eastern Ave., Cincinnati, Ohio
Illinois Gear & Mch. Co., 2108 N. Natchez Ave., Chicago 5, Ill.
New Jersey Gear & Mfg. Co., Hillside, N. J.
Ryerson, Jos. T. & Son, Inc., 16th and Rockwell St., Chicago 8, Ill.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio

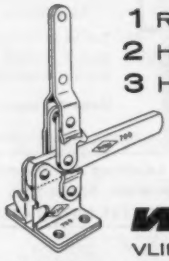
GEARS, Cut
Avondale Marine Ways, Inc., New Orleans, La.
Birdsboro Corp., Birdsboro, Pa.
Boston Gear Works, 14 Hayward St., Quincy 71, Mass.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio
Diefendorf Gear Corp., Box 934, Syracuse, N.Y.
Equitable Engineering, Royal Oak, Mich.
Greaves Machine Tool Co., 2011 Eastern Ave., Cincinnati, Ohio
Illinois Gear & Mach. Co., 2108 N. Natchez Ave., Chicago 5, Ill.
Invo Spline, Inc., Hazel Park, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 13, Mich.

(Continued on page 282)

There's a WESPO clamp or plier for every clamping job!

80 models and sizes...

made better three ways to give more positive holding, last longer!



1 Reamed holes
2 Hardened serrated bushings
3 High tensile strength rivets

send for free catalogs describing Wespo clamps and fixture details

WESPO DIVISION
VLIER ENGINEERING CORPORATION
Formerly West Point Manufacturing Company
26935 W. Seven Mile Road • Detroit 19, Michigan

For more data circle this page number on card at back of book

New Jersey Gear Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

GENERATORS, Electric
Reliance Electric & Engrg. Co., 1200 Ivanhoe Rd., Cleveland 10, Ohio

GRADUATING MACHINES
Gorton Geo., Mch. Co., 1321 Racine St., Racine, Wis.
Pratt & Whitney Co., Inc., W. Hartford, Conn.

GREASES—See Lubricating Oils and Greases

GRINDERS, Bench, Floor and Snag
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Mummurt-Dixon Co., Hanover, Pa.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

GRINDERS, Carbide Tool
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
DoALL Co., Des Plaines, Ill.
Elox Corp. of Michigan, Troy, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Standard Electrical Tool Co. 2488-90 River Rd., Cincinnati, Ohio
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.

GRINDERS, Die and Mold
DoALL Co., Des Plaines, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

GRINDERS, Drill Point
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Consolidated Mch. Tool Div., 565 Blossom Rd., Rochester 10, N. Y.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Oliver Instrument Co., 1410 E. Maumee, Adrian Mich. (also drill point thinner)
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4, Ohio

GRINDERS, Face Mill
Kearney & Treaker Corp., 6784 W. National, Wilwaukee 14, Wis.
Mattison Machine Works 454 Blackhawk Park Ave., Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

GRINDERS, Knife and Shear
Hill Acme Co., 1201 W. 65th St. Cleveland 2, Ohio
Mattison Machine Works, Rockford, Ill.
Mummert-Dixon Co., Hanover, Pa.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio

GRINDERS, Portable Electric
Chicago Pneumatic Tool Co., New York 17, N. Y.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio

GRINDERS, Portable Pneumatic
Chicago Pneumatic Tool Co., New York 17, N. Y.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., Niles, Ill.

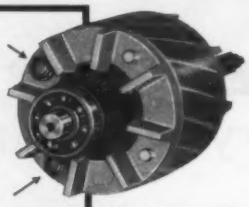
GRINDERS, Tap
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

GRINDERS, Tool and Cutter
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Elox Corp. of Michigan, Troy, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield Vt.
Gallmeyer & Livingston Co. 336 Straight Ave., S. W., Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gorton Geo., Mch. Co., 1321 Racine St., Racine, Wis.
Landis Tool Co., Waynesboro Pa.
Leblond, R. K. Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Mummert-Dixon Co., Hanover, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Thompson Grinder Co. 1500 W. Main St., Springfield, Ohio

GRINDERS, Toolpost
Cosa Corp., 305 Lexington Ave., New York 17, N. Y.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

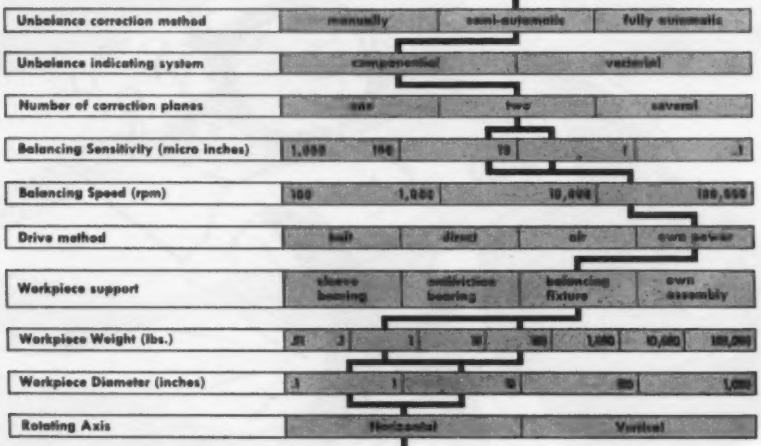
GRINDING GAGES—See Gages, Grinding

Choose The Balancing Features That Meet Your Workpiece Needs EXACTLY on a Schenck



Completely efficient balancing is possible only on a balancing machine that can be adapted *exactly* to individual workpiece requirements. And this close correlation of method to part is possible only when you have a *complete* choice of various balancing methods.
Schenck Balancing Machines offer you not just a wide variety of balancing methods, but the particular type of each method best suited to your component.

Motor armature with precast bosses. Balance corrected with washers (arrows)



Depending on your operation, Schenck can provide you with:

A highly efficient single-purpose machine.

An extremely flexible universal model.

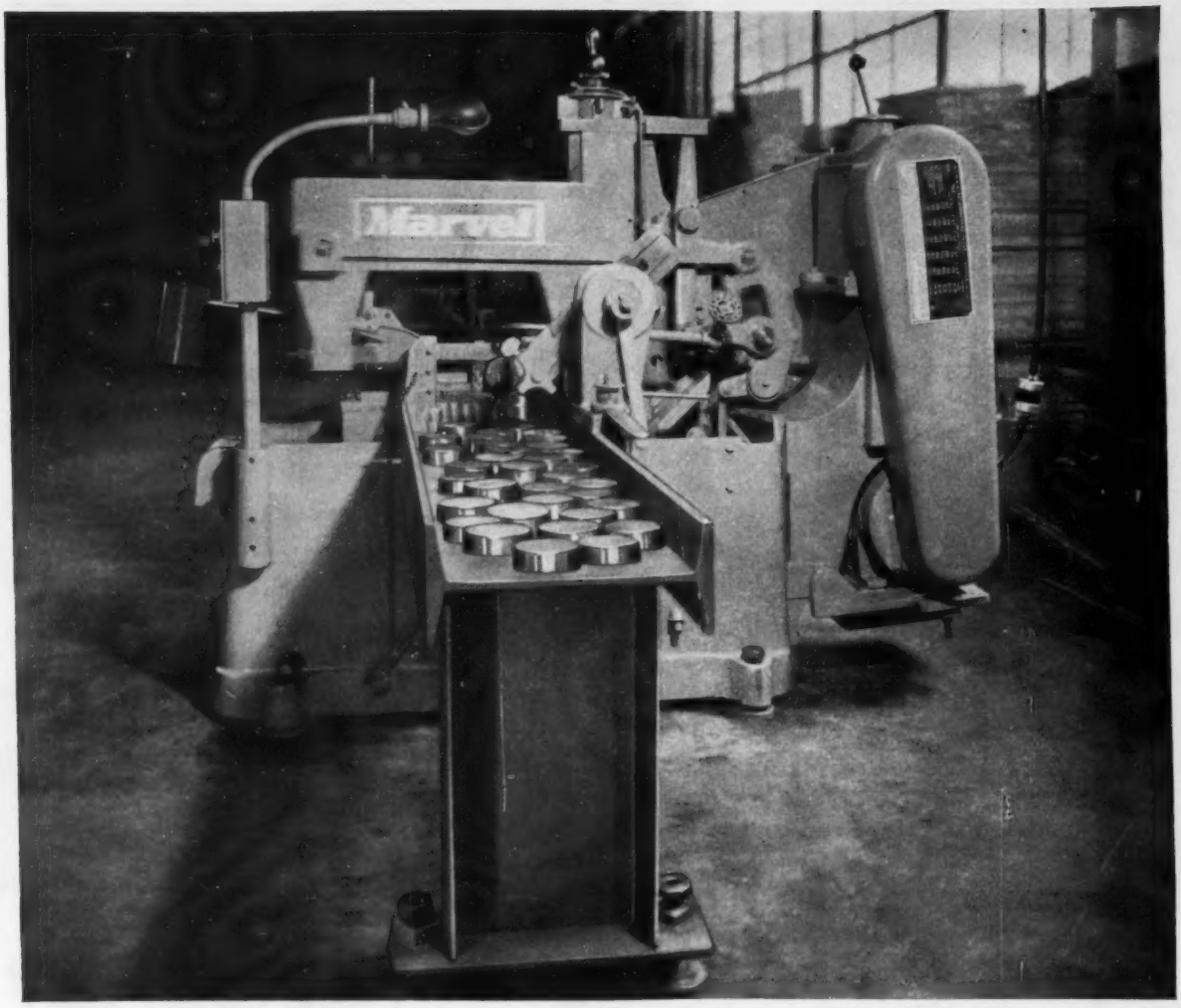
Let us study *your* balancing program and suggest a Schenck machine adapted specifically to *your* requirements.

Write For More Information

Model R-02 Schenck Balancer

COSA

Importers of Leading Precision Machine Tools
Nationwide Sales and Service
COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.



Payoff End of a Production Marvel

A cut-off saw's value is proven at the discharge end of the machine. How quickly the trough is filled with accurately cut-off pieces can mean the difference between profit and loss on many jobs.

The R. J. Sudrick Co., Des Plaines, Illinois, manufacturers of precision aircraft components had to cut-off 4600 blanks from 3¼" round, 303 Stainless Steel Bars.

They bought our MARVEL No. 6A4 High Speed Heavy Duty Automatic Bar Feed Hack Saw Machine; used MARVEL High-Speed-Edge Hack Saw Blades, and got the high production, accuracy and economy they desired.

PRODUCTION? Constant at 20 pieces per hour floor to floor

ACCURACY? Held well within the permissible tolerance of +.010 —.000

BLADE COST? Just 1½¢ per cut. Only twenty-three MARVEL blades were needed to make the 4600 cuts, and not a single blade failure due to blade breakage. MARVEL High-Speed-Edge Blades are unbreakable.

MMT·PE

The point is this: MARVEL Metal Cutting Hack Saws equipped with MARVEL High-Speed-Edge Hack Saw Blades are an unbeatable combination for economical, accurate and safe cutting-off.

If your hack saws are not producing the economy you need to meet today's competition, try MARVEL High-Speed-Edge Blades. They will give you the competitive edge every time. Write for Catalog C-85 which has the complete story on MARVEL Hack Saws and Band Saws, Hack Saw Blades and Band Saw Blades.

ARMSTRONG-BLUM MFG. CO.

5700 W. BLOOMINGDALE AVE., CHICAGO 39, ILL.

MARVEL Metal Cutting SAWS

Better Machines–Better Blades

For more data circle this page number on card at back of book

CDT can help you cut costs

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.

FREE: *New brochure listing facilities, equipment, etc. Write today.*

Columbus Die-Tool
AND MACHINE COMPANY
P.O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

GRINDING MACHINES, Abrasive Belt
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio
Mattison Mch. Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

GRINDING MACHINES, Broach
Gallmeyer & Livingston Co., 336 Straight, S. W., Grand Rapids 2, Mich.
Lapointe Machine Tool Co., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Detroit 13, Mich.
Orban Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Thompson Grinder, 1534 W. Main, Springfield, Ohio

GRINDING MACHINES, Cam
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Van Norman Machine Co., 3640 Main St., Springfield 7, Mass.

GRINDING MACHINES, Centerless
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati Milling Machine Co., Grinding Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Waynesboro, Pa.
Van Norman Machine Co., 3640 Main St. Springfield 7, Mass.

GRINDING MACHINES, Crankshaft
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Van Norman Machine Co., 3640 Main St., Springfield 7, Mass.

GRINDING MACHINES, Cylindrical
Austin Industrial Corp., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Grinding Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17 N. Y.
Gallmeyer & Livingston Co., 338 Straight, S. W., Grand Rapids 2, Mich.
Hammond Machinery Builders Inc., Kalamazoo, Mich.
Landis Tool Co., Waynesboro, Pa.
Micromatic Hone Corp., 81,1000 Schoolcraft Ave., Detroit 38, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Sheffield Corp., Box 893, Dayton 1, Ohio
Standard Electrical Tool Co., 2500 River Rd., Cincinanti 4, Ohio
Van Norman Machine Co., 3640 Main St., Springfield 7, Mass.

GRINDING MACHINES, Disc
Brown & Sharpe Mfg., Co., Providence, R. I.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., Beloit, Wis.
Mattison Machine Co., Beloit, Wis.
Standard Electrical Tool Co., 2489-90 River Rd., Cincinnati, Ohio

GRINDING MACHINES, Gear
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 13, Mich.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. Y.
Sheffield Corp. Box 893, Dayton 1, Ohio

GRINDING MACHINES, Internal
Bryant Chucking Grinder Co., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gallmeyer & Livingston Co., 336 Straight, S. W., Grand Rapids 2, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. Y.
Standard Electrical Tool Co. 2488-90 River Rd., Cincinnati, Ohio
Van Norman Machine Co., 3640 Main St., Springfield 7, Mass.
Wicaco Machine Corp., Wayne Junction, Philadelphia, Pa.

NEW: "Big" drilling jobs made easy

Delta 20" Drill Press, also 17", 15", 14" and 14" Super-Hi Sensitive. Available in floor, bench and multiple spindle models.

This custom "radial drill" is provided by combining standard Delta drill press components—an 8-ball bearing traveling carriage, husky 33" column, raising mechanism and choice of four Delta 20" drill heads. Suspended from an overhead trackway, it swings to any position over the work—handles jobs too big for conventional drilling, in production runs too small to justify an expensive machine tool.

But whether your production requirements call for special set-ups or standard tooling, you'll find that Delta drill presses offer you money-saving versatility and precision performance under the most rugged work loads. Delta drill presses have set the industry standard for years because they cost less to buy, operate and maintain.

Choose from the world's most complete drill press line—visit your Delta Industrial Distributor (listed under "TOOLS" or "MACHINERY" in the Yellow Pages). For FREE Delta Industrial Catalog showing 61 machines, 302 models, over 1400 accessories, write: Rockwell Manufacturing Company, Delta Power Tool Division, 614D N. Lexington Ave., Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Guelph, Ontario.

DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

Visit Delta in Booth No. 2046 at the A.S.T.E. Show

Why Cadillac Gage MICROHONES* Drilled Bores in Hydraulic Units

Since 1940, Cadillac Gage Company has been known for the quality of its high precision gages. Cadillac's production "know-how" in obtaining close tolerances has in recent years led to diversification in precision products.

From Gages to Tank Turrets

For example, Cadillac has developed and are now producing, for a prime contractor, hydraulic systems that control gun elevation and traverse of gun turrets on military tanks. In these units, geometric tolerances in millionths of an inch and a controlled surface finish are mandatory for smooth, dependable performance. That is why sleeve bores in control valves and lock valve bodies are Microhoned.

Simple collet-chuck fixturing permits fast, easy accommodation of various workpiece sizes. A Micromatic-designed tool speeds tool changeover.

Efficient Stock-Removal and High Precision

Because Microhoning is both a stock-removal and a precision finishing process, Cadillac engineers specified only two machining operations for the sleeve bores: drilling and Microhoning. Sleeves (hardened to 63 R "C") are Microhoned to generate roundness and straightness within 20 millionths of an inch tolerance over the full length of the bore. Also, in removing from .008" to .010" of stock, Microhoning consistently produces a surface finish of 4 micro-inches rms.

MMT-PE

Higher Quality — Lower Scrap

Every Microhoned bore is checked on a precision air gage . . . this 100% inspection insures highest quality control. Mating spools are selectively fitted to the Microhoned sleeve and clearance is held to between .00002" and .0001". Every sleeve and spool assembly must withstand a rigorous 3,000 psi leakage test. Scrap rate is practically nil.

With Micromatic equipment, Cadillac has substantially increased production; they control surface finish within closer limits; consistently generate specified geometric accuracy: and practically eliminate scrap. How Microhoning accomplishes these results is explained on facing page.

*Registered U.S. Pat. Off.

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

GRINDING MACHINES, Jig
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock St., Cincinnati 23, Ohio
Gallmeyer & Livingston Co., 336 Straight S. W., Grand Rapids 2, Mich.
Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport, Conn.
Pratt & Whitney Co., Inc., W. Hartford, Conn.

GRINDING MACHINES, Profile
Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Sheffield Corp., Box 893, Dayton 1, Ohio

GRINDING MACHINES, Roll
Austin Industrial Corp., White Plains, N. Y.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Surface Reciprocating
Brown & Sharpe Mfg., Co., Providence, R. I.
Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
DoALL Co., Des Plaines, Ill.
Elox Corp. of Michigan, Troy, Mich.
Gallmeyer & Livingston Co., 336 Straight, S. W., Grand Rapids 2, Mich.
Gardner Machine Co., Beloit, Wis.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio
Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. Y.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio
Van Norman Machine Co., 3640 Main St., Springfield 7, Mass.

GRINDING MACHINES, Surface Rotary
Berthiez, Charles, 5 Rue Montalivet, Paris, France
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. Y.
Thompson Grinder Co. 1500 W. Main St., Springfield, Ohio
Walker, O. S. Co., Inc., Worcester, Mass.

GRINDING MACHINES, Thread
Austin Industrial Corp. White Plains, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch Co., Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro, Pa.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. Y.
Sheffield Corp,. Box 893, Dayton 1, Ohio

GRINDING MACHINES, Universal
Austin Industrial Corp., White Plains, N. Y.
Brown & Sharpe Mfg., Co., Providence, R. I.
Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gallmeyer & Livingston Co., 336 Straight, S. W, Grand Rapids 2, Mich.
Gorton Mch. Co., Geo., 1321 Racine St., Racine, Wis.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

Olivetti Corp of America, 42-33 Northern Blvd., Long Island City 1, N. Y.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. Y.
Springfield Machine Tool Co., Springfield, Ohio

GRINDING WHEEL DRESSING and FORMING DEVICES
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Metal Carbides Corp., Youngstown, Ohio
Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport 7, Conn.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Box 893, Dayton 1, Ohio

GRINDING WHEELS
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Cincinnati Milling Machine Company, Cincinnati Milling Products Div., Marburg, Ave., Cincinnati 9, Ohio
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., Beloit, Wis.
Macklin Co., Jackson, Mich.
Metal Carbides Corp., Youngstown, Ohio
Norton Co., 1 New Bond St., Worcester 6, Mass.

GROOVING TOOLS, Internal
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Penna.
Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N. Y.
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.

HAMMERS, Drop—See Forging Hammers

HAMMERS, Portable Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

HAMMERS, Power
Chambersburg Engrg. Co., Chambersburg, Pa.
Edlund Mchry. Co. Div., Cortland, N. Y.
Erie Foundry Co., 1253 W. 12th St., Erie Penna.
Yoder Co., 5504 Walworth Ave., Cleveland 2, Ohio

HARDENING FURNACES
General Electric Co., Schenectady, N. Y.

HARDNESS TESTERS
Clark Instrument, Inc., Dearborn, Mich.
Shore Instrument & Mfg. Co., 90-35C Van Wyck Exp., Jamaica 35, N. Y.

HEAT-TREATING EQUIPMENT — See Annealing Furnaces, Flame Hardening Machines, Induction-Heating Equipment

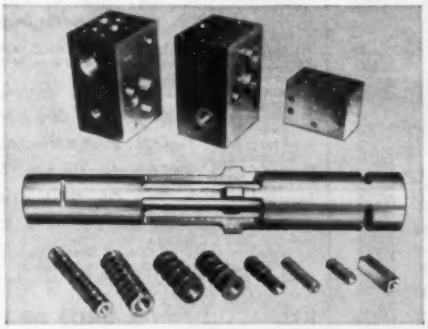
HOBS
Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Twist Drill & Tool Co. Rochester, Mich.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

HOISTS, Air
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

HONING MACHINES
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit 38, Mich.
Moline Tool Co., 102-120th St., Moline, Ill.
Superior Hone Corp., 1623 Elreno St., Elkhart, Ind.
Van Norman Machine Co., 3640 Main St., Springfield 7, Mass.

How Cadillac Gage MICROHONES Drilled Bores in Hydraulic Units

Here's how Cadillac Gage Company uses just drilling and Microhoning to secure higher production, reduce costs and obtain high accuracy in producing precision bores for hydraulic units that control gun elevation and traverse of gun turrets on military tanks.



This representative range of sleeves and other hydraulic components include both soft and hardened steels.

MMT-PE

Microhoning Bores in Hard Steel

Following the drilling operation, bores are Microhoned in at least eight different sizes of sleeves that are hardened to 63 R "C". Bore diameters range from .250″ to .875″ and in lengths up to 5.50″. From .008″ to .010″ of stock is removed in an average Microhoning cycle of about two minutes. A surface finish of four microinches, rms, is consistently obtained while generating roundness and straightness within 20 millionths of an inch tolerance over the full length of the bore. Also, because the free-floating Microhoning tool follows the neutral axis of the drilled hole, the bore location remains unchanged.

Microhoning Bores in Soft Steel

Another component of these hydraulic units is a cylinder whose bore is 1.625″ in diameter and 19″ long. Because the maximum stroke of the Hydrohoner machines being used is 15″, the cylinder is turned end-for-end during the Microhoning of the bore. Following a deep-hole drilling, Microhoning removes from .012″ to .015″ of stock in generating a controlled surface finish and correcting geometric inaccuracies.

Microhoning Blind-End Bores

In addition to bores in hardened steel sleeves and soft steel cylinders, Cadillac also Microhones several bores in soft steel valve bodies. One of these is a blind-end bore. It is .625″ in diameter, 1.75″ long and has a $\frac{1}{16}$″ relief at the bottom. Microhoning is specified to hold geometric tolerances within .0001″.

In the processing of precision bores in a variety of components for hydraulic units, Cadillac Gage is giving versatile and tangible expression to "precision production through Microhoning."

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

For more data circle this page number on card at back of book

KNOW YOUR SPEED

with the accurate
SERVO-TEK SPEED
INDICATING SYSTEM

A truly versatile "package" provides accurate speed indication for almost anything that moves. Nearly every industrial process or machine can benefit by the economy and safety of continuous speed indication.

FEATURES

- **SELF-POWERED** No batteries or external power required.
- **LOW VOLTAGE** Connecting cable can be as long as 500 ft. for remote readings.
- **PERMANENTLY LUBRICATED BALL BEARINGS** Sealed against foreign particles and harmful vapors.
- **EASILY READ 4½" INDICATOR** Damped to withstand vibration and shock.
- **STANDARD RANGES** 0 to 100, 500, 1000, 2000, 3000, 4000, 6000, 8000, 10,000 and 12,000 RPM. These speeds can also be provided to read "Percent of Full Speed" or "Percent of Capacity."
- **STANDARD (SAE) AUTOMOTIVE AND AIRCRAFT MOUNTS**, as well as special scales, also available.

$87.00 includes generator, indicator (specify range), mounting base, coupling, and 15 ft. of electrical cable. Delivery from stock. Quantity discounts.

Servo-Tek
PRODUCTS CO
INCORPORATED

Main Office
1086 Goffle Road, Hawthorne, N. J.

Western Office
14736 Arminta Street, Van Nuys, Cal.

For more data circle Item 288A on Card

HONING STONES
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit 38, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.

HOSE
American Metal Hose Br. American Brass Co., 35 Broadway, New York, N. Y.
Schrader's Son, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.

HYDRAULIC MACHINERY
Tools and equipment
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Bethlehem Steel Corp., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss E. W., Co., 1375 Raff Rd., E. W. Canton, Ohio
Burg Tool and Mfg. Co., Inc., 15001 S. Figueora, Gardena, Calif.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engineering Div. American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tenessee Ave., Cincinnati 29, Ohio
Erie Foundry Co., Erie, Pa.
Hannifin Co., Div., Parker-Hannifin Corp., Des Plaines, Ill.
Hydraulic Press Mfg., Mount Gilead, Ohio
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Northern Hydraulics & Mch. Corp., Melrose Park, Ill.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Snyder Corp., 3400 E. Lafayette Ave., Detroit 24, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Vickers Incorporated Div. of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich.
Wilson, K. R., Inc., 211 Mill St., Arcade N. Y.

HYDRAULIC POWER UNITS OR TOOL HEADS
Barnes Drill Co. 814 Chestnut, Rockford 3, Ill.
Barnes W. F. & John Co., 201 S. Waterford St., Rockford, Ill.
Denison Engineering, Div. American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Vickers Incorporated, Div. of Sperry Rand Corporation, 1402 Oakman Blvd., Detroit, Mich.

INDEXING and SPACING EQUIPMENT
Austin Industrial Corp., White Plains, N. Y.
Brown & Sharpe Mfg., Co., Providence, R. I.
Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Eisler Engrg. Co., Inc., 750 South 13th St., Newark, N. J.
Equitable Engineering, Royal Oak, Mich.
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Opto-Metric Tools, Inc., 137 Varick St., New York, N. Y.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Precision Processing Co., 3269 Casitas Ave., Los Angeles 39, Cal.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Machine Co., 3640 Main St., Springfield 7, Mass.

INDICATOR BASES, Magnetic
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence, R. I.
Orban Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. Y.

INDICATORS, Dial
Ames B. C., Waltham 54, Mass.
Brown & Sharpe Co., Providence, R. I.
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
National Automatic Tool Co., S. 7th-N. Sts., Richmond, Ind.

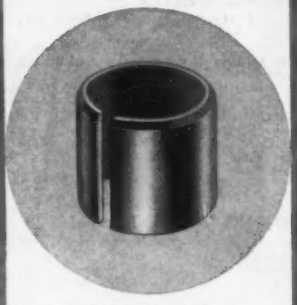
INDICATORS, Speed
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Machine Tool Co., 839 Greene St., Ann Arbor, Mich.
General Electric Co., Schenectady, N. Y.

GILLEN

EVERY TYPE OF KEYING AND PINNING DEVICE FOR PRODUCTION ASSEMBLING

Eliminate expensive machining and fitting with
NEW GILLEN
Hardened Spring Steel
TENSION BUSHES

Self-Seating • Self-Fitting
Long Wearing • Economical



STRAIGHT SLOT

ARROW SLOT

SLANTED SLOT

Internal or External Types
Many lengths and diameters.
Chamfered for
Quick and Easy Insertion.

Write for complete information

JOHN GILLEN COMPANY
2552 South 50th Avenue
Cicero 50, Illinois

PIVOTS • BUSHES • TENSION, TAPER, GROOVE & DOWEL PINS • MACHINE KEYS & PARTS

SUBSIDIARY OF STANDARD RAILWAY EQUIPMENT MANUFACTURING COMPANY

For more data circle Item 288B on Card

Announcing

an important new development for quality control measurement

AMES MODEL AG7

Accu-Flow* Air Gage Recorder

A permanent record of continuous measurements can be made in magnifications of 1750 to 1—3500 to 1—and 17,500 to 1.

Measurements are recorded by a "hot needle" on 2"-wide chart paper. The width of the paper may be made to equal measurements as small as a tenth of one-thousandth or as wide as four-thousandths. This allows the reproduction of minimum graduations representing two millionths or twenty millionths of an inch.

The AG7 provides a completely impersonal measurement record that can be used both as a controlling device and as a means of furnishing visible "proof of precision" to buyers of the measured products. Send for free ACCU-FLOW FOLDER.

*Trademark of B. C. Ames Co.

BOOTH 714—ASTE TOOL SHOW—Detroit, April 21-28

Representatives in Principal Cities

B.C. AMES CO. *27 Ames Street, Waltham 54, Mass.*

Canadian Representatives—H. C. Burton Co. Ltd., Hamilton

MANUFACTURERS OF MICROMETER DIAL INDICATORS AND GAGES

LepeL

HIGH FREQUENCY INDUCTION HEATING UNITS

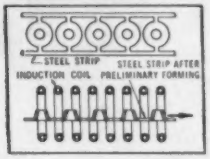
Lepel induction heating equipment represents the most advanced thought in the field of electronics... the most practical and efficient source of heat developed for numerous industrial applications. You are invited to send samples of work with specifications. Our engineers will process and return the completed job with full data and recommendations without cost or obligations.

TYPICAL INDUCTION HEATING APPLICATIONS

PLASTIC COATING OF TOOL HANDLES

A production line operation for coating handles of tools at Whitney Metal Tool Co., Rockford, Ill. uses induction heating with excellent results. The handles only are heated by induction to the desired temperature then dipped into a vinyl chloride base coating material for a short period depending upon the thickness of coating desired. The plastic coating formed on the handles is then cured by immersion in a carbo-wax bath.

FORMING OF METAL STRIP FACILITATED BY PROGRESSIVE ANNEALING



Metal forming operations which require intermediate anneals to restore ductility can be facilitated by induction annealing the strip progressively. Diagram illustrates this procedure for partially formed thin austenitic stainless steel strip. The induction annealing operation is scheduled in the production line between two press operations. Metal strip and wire of other materials are also induction annealed in this manner.

WRITE FOR NEW LEPEL CATALOG
Electronic Tube Generators from 1 Kw to 100 Kw.
Spark Gap Converters from 2 Kw to 30 Kw.

LepeL HIGH FREQUENCY LABORATORIES, INC.
55th ST. & 37th AVE., WOODSIDE 77, N. Y.

INDICATORS, Test

Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., 1144 Eddy St., Providence, R. I.
National Automatic Tool Co., S. 7th & N. Sts., Richmond, Ind.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

INDUCTION HEATING EQUIPMENT

Cincinnati Milling Machine Co., Meta-Dynamics Div., Marburg Ave., Cincinnati 9, Ohio
General Electric Co., Schenectady, N. Y.
Induction Heating Corp., 181 Wythe Ave., Brooklyn 11, N. Y.
Lepel High Frequency Laboratories, Inc., Woodside 77, N. Y.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. Y.

INTENSIFIERS, Hydraulic

Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Logansport Mch. Co., Inc., Logansport, Ind.

JACKS, Planer—See Set-Up Equipment

JIG BORERS

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Austin Industrial Corp., White Plains, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
DeVlieg Machine Co., Fair St., Royal Oak, Mich.
Fesdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio
Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport, Conn.
Orban Kurt., Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Scherr, George Co., Inc., 200 Lafayete St., New York 12, N. Y.

JIGS AND FIXTURES

Bath, Cyril Co., Aurora & Solon Road, Solon, Ohio
Columbus Die Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio
Ingersoll Milling Machine Co., 505 Fulton Ave., Rockford, Ill.
Metal Carbides Corp., Youngstown 12, Ohio
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Woodworth, N. A. Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

KEYSEATERS

Baker Bros. Inc., Station F, P. O. Box 101, Toledo 10, Ohio
Bliss, E. W. Co., Canton, Ohio
Mitts & Merrill, 1809 S. Water St., Saginaw, Mich.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

KNURLING TOOLS

Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 46, Ill.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Reed Rolled Thread Die Co., Holden, Mass.
Williams J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

LAPPING MACHINES

Cincinnati Milling Machine Co., Grinding Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
DoALL Co., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit 38, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.

LATHE ATTACHMENTS

Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Jones & Lamson Mch. Co., 512 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Nebel Machine Tool Corp., 3401 Central Pkwy., Cincinnati 25, Ohio
Precision Processing Co., 3269 Casitas Ave., Los Angeles 39, Cal.
Sheldon Mch. Co., Inc., 4235 N. Knox Ave., Chicago 41, Ill.
Sidney Mch. Tool Co., Sidney, Ohio
Williams J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

LATHES, AUTOMATIC—See Chucking Machines

LATHES, Axle

Consolidated Mch. Tool Div., Farrel-Birmingham Co., Inc., Rochester 10, N. Y.
Hamilton Div., Baldwin-Lima-Hamilton Corp. Hamilton, Ohio
Monarch Mch. Tool Co., Oak St., Sidney, Ohio
Orban, Kurt., Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Bench

Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds. Cincinnati 18, Ohio
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.

LATHES, Car Wheel

Bullard Co., Bridgeport 6, Conn.
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.
Hamilton Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio
Snyder Corp., 3400 E. Lafayette Ave., Detroit 24, Mich.

LATHES, Center Drive

Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.

LATHES, Copying, Duplicating — See Lathes, Duplicating

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Wickes Mch. Tool Div., Wickes Corp., Saginaw, Mich.

LATHES, Double-End

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12 Ohio
Consolidated Mch. Tool Corp., Rochester N. Y.
LeBlond, R. K. Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Sundstrand Mch. Tool Co., 2351 11th St., Rockford, Ill.
Wickes Mch. Tool Div., Wickes Corp., Saginaw, Mich.

LATHES, Duplicating

Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Monarch Machine Tool Co., 27 Oak St., Sidney Ohio
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sidney Machine Tool Co., Highland Ave., Sidney, Ohio

LATHES, Engine, Manufacturing

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio
Carroll-Jamieson Mch. Tool Co., Bataria, Ohio
Cincinnati Lathe & Tool Co., 3207 Disney St., Cincinnati 9, Ohio
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.
Hendey Mch. Div., Barber Colman Co., Rockford, Ill.
Lapointe Machine Tool Co., Hudson, Mass.
LeBlond, R. K. Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio

Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Nebel Machine Tool Corp., 3401 Central Pkwy., Cincinnati 25, Ohio
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Mch. Tool Co., Sidney, Ohio
Springfield Machine Tool Co., Springfield, Ohio
Wickes Mch. Tool Div., Wickes Corp., Saginaw, Mich.

LATHES, Engine, Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio
Carroll-Jamieson Mach. Tool Co., Batavia, Ohio
Cincinnati Lathe & Tool Co., 3207 Disney St., Cincinnati 9, Ohio
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Hardinge Bros. Inc., 1420 College Ave., Elmira, N. Y.
Hendey Mch., Div., Barber Colman Co., Rockford, Ill.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Logan Engineering Co., 4901 Lawrence Ave., Chicago 30, Ill.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio
Nebel Machine Tool Corp., 3401 Central Pkwy., Cincinnati 25, Ohio
Orban, Kurt Co., Inc., 42 Exchange Place Jersey City 2, N. J.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Mach. Tool Co., Sidney, Ohio
Springfield Machine Tool Co., Springfield, Ohio
Wickes Mch. Tool Div., Wickes Corp., Saginaw, Mich.

LATHES, Gap

Cincinnati Lathe & Tool Co., 3207 Disney St., Cincinnati 9, Ohio
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Clearing Div., of U. S. Industries, Inc., 649 W. 65th St., Chicago 38, Ill.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Nebel Machine Tool Corp., 3401 Central Pkwy., Cincinnati 25, Ohio
Sidney Machine Tool Co., Highland Ave., Sidney, Ohio
Springfield Machine Tool Co., Springfield, Ohio

LATHES, Hollow Spindle

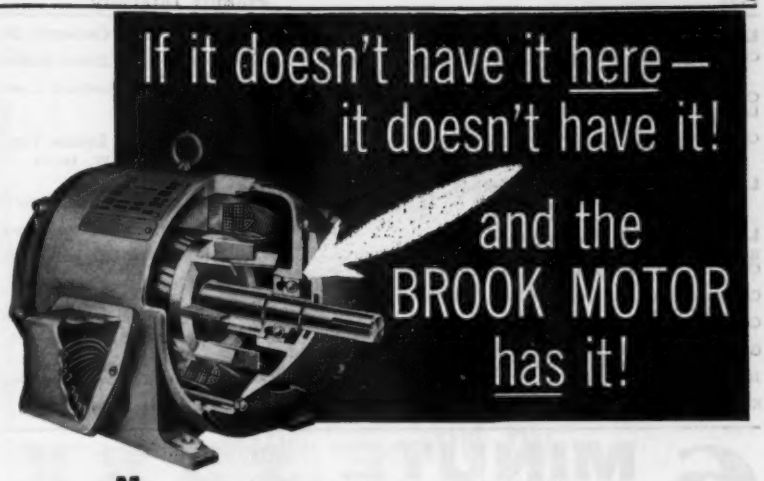
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio

LATHES, Roll

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati 2, Ohio
Bliss E. W. Co., Canton, Ohio
Hamilton Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Monarch Mch. Tool Co., Oak St., Sidney, Ohio
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

LATHES, Speed, Second-operation

Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Monarch Mch. Tool Co., Oak St., Sidney, Ohio
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., 4258 N. Knox Ave., Chicago 41, Ill.
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4, Ohio



MANY MOTORS look practically alike on the outside, but it's what is inside that counts. There is no motor with better windings or more ample bearings — few motors compare favorably. Yet, the Brook Motor costs less, because of volume production, modern techniques, distribution in 76 countries and a realistic pricing policy. Brook Motors have established excellent performance records for over 56 years in every industry using a.c. motors. From 1 to 600 H.P. Send for literature.

SINCE 1904
BROOK ELECTRIC MOTORS

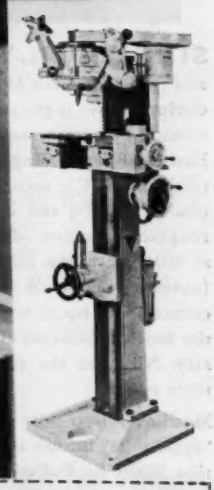
world's most respected motor

BROOK MOTOR CORPORATION
3302-04 W. Peterson Ave., Chicago 45, Illinois
Factory Representatives, Warehouses, Dealers in Principal Cities.
In Canada: Brook Electric Motors of Canada, Ltd.
250 University Ave., Toronto, Canada

For more data circle Item 291A on Card

TECHNICA

Shown Below
Technica ZSM
Center Hole
Grinding
Machine



The NEW CENTER GRINDING MACHINE for GENERATING CENTERS

Many Top Satisfied American Users. Names on Request.

The Only Way to Produce True Centers, Precisely, Quickly, and Economically.

Send today for our new 12 page catalog — "Free". Complete information about all famous Technica Center Generating Machines.

HIGH PRECISION PRODUCTS
WESTFIELD, NEW JERSEY

To: High Precision Products, Westfield, New Jersey
Please send catalog and prices for new Technica Center Generating Machine. ☐ One ☐ Two
Name.....
Firm Name.....
Address.....
City.....State.....

For more data circle Item 291B on Card

LATHES, Spinning
Cincinnati Milling Machine Co., Meta-Dynamics Div., Marburg Ave., Cincinnati 9, Ohio (Hydrospin)
Cosa Corp., 405 Lexington Ave., New York 17
Ladge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

LATHES, Toolroom—See Lathes, Engine, Toolroom

LATHES, Turret, Automatic
Bullard Co., Bridgeport 2, Conn.
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Jones & Lamson Mch. Co., 512 Clinton St., Springfield, Vt.
King Machine Tool Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
New Britain Mch. Co., New Britain-Gridley Div., New Britain, Conn.
Pratt & Whitney Co., Inc., W. Hartford, Conn. (Potter & Johnston)

LATHES Turret, Ram Type, Saddle Type
Bardons & Oliver, Inc., 1133 W. Ninth St., Cleveland 13, Ohio
Bullard Co., Bridgeport 2, Conn.
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc., 1420 College Ave., Elmira N. Y.
Jones & Lamson Mch. Co., 512 Clinton St., Springfield, Vt.
Lapointe Machine Tool Co., Hudson, Mass.
New Britain Mch. Co., New Britain-Gridley Div., New Britain, Conn.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mach. Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio

LATHES, Turret, Vertical—See Boring Mills, Vertical

LAYOUT and DRAFTING TOOLS
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.

LEAD SCREWS & SPLINES, Ball Bearing
Saginaw Steering Gear Div. General Motors Corp., Saginaw, Mich.

LEVELS
Pratt & Whitney Co., Inc., W. Hartford, Conn.

LIMIT SWITCHES—See Switches, Limit

LUBRICATING OILS and GREASES
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A. Oil Co., Ltd., 2727 S. Troy St., Chicago 23, Ill.
Texaco, Inc., 135 E. 42nd St., New York 17, N. Y.

LUBRICATING SYSTEMS
Farval Corp., 3249 E. 80th St., Cleveland 4, O.
Madison-Kipp Corp., Madison, Wis.
Trabon Engineering Corp., Solon, Ohio

MACHINERY, Used and Rebuilt
Eastern Mchry Co., 1000 Tennessee Ave., Cincinnati, Ohio
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Miles Mchry. Co., 2025 E. Genesee Ave., Saginaw, Mich.
Motch & Merryweather Mchry. Co., 888 E. 70th St., Cleveland 3, Ohio
Van Keuren Co., Watertown 72, Mass.

MACHINISTS' SMALL TOOLS
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
DoALL Co., Des Plaines, Ill.
Niagara Mch. & Tool Wks., 637-697 Northland Ave., Buffalo 11, N. Y.
Van Keuren Co., 176 Waltham St., Watertown 72, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

MANDRELS—See Arbors and Mandrels

MARKING MACHINES and DEVICES
Gorton Mch. Co., 1321 Racine St., Racine, Wis.
Pannier Corp., 319 Pannier Bldg., Pittsburgh 12, Pa.

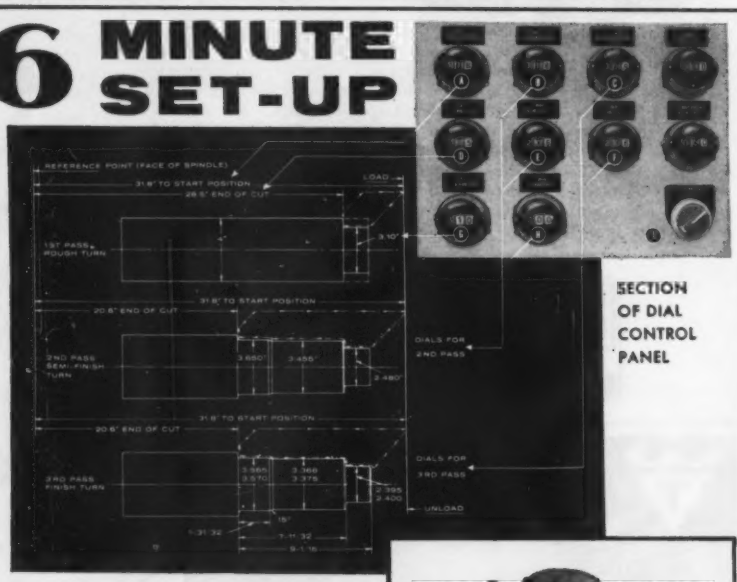
MATERIAL-HANDLING TRUCKS—See Trucks, Material Handling

MEASURING MACHINES
Cosa Corp., 305 Lexington Ave., New York 17, N. Y.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Van Keuren Co., 176 Waltham St., Watertown 72, Mass.

MEASURING WIRES, Thread, Spline, Gear
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Dayton 1, Ohio
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Van Keuren Co., 176 Waltham St., Watertown 72, Mass.

MICROMETER HEADS
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
DoALL Co., Des Plaines, Ill.

6 MINUTE SET-UP



SECTION OF DIAL CONTROL PANEL

SIMPLY DIAL YOUR SET-UP

and the Seneca Falls Model Q Lathe is producing. Above is the geometry of a simple turning operation requiring three passes. First, dial the starting position of the cut (dials A, B, C); second, dial end of cut (dials D, E, F); and third, dial the 3.10" roughing diameter (dial G). Dial H is set at 0.00 since the second pass is a bias (oversize) cut made with tracer-template control. The tracer-template also controls the finish turn so no dial setting is necessary. Now set the selector switch I for three passes.

Machine set-up now complete; press the "cycle-start" button and you're in production. Write for Bulletin No. Q-59.

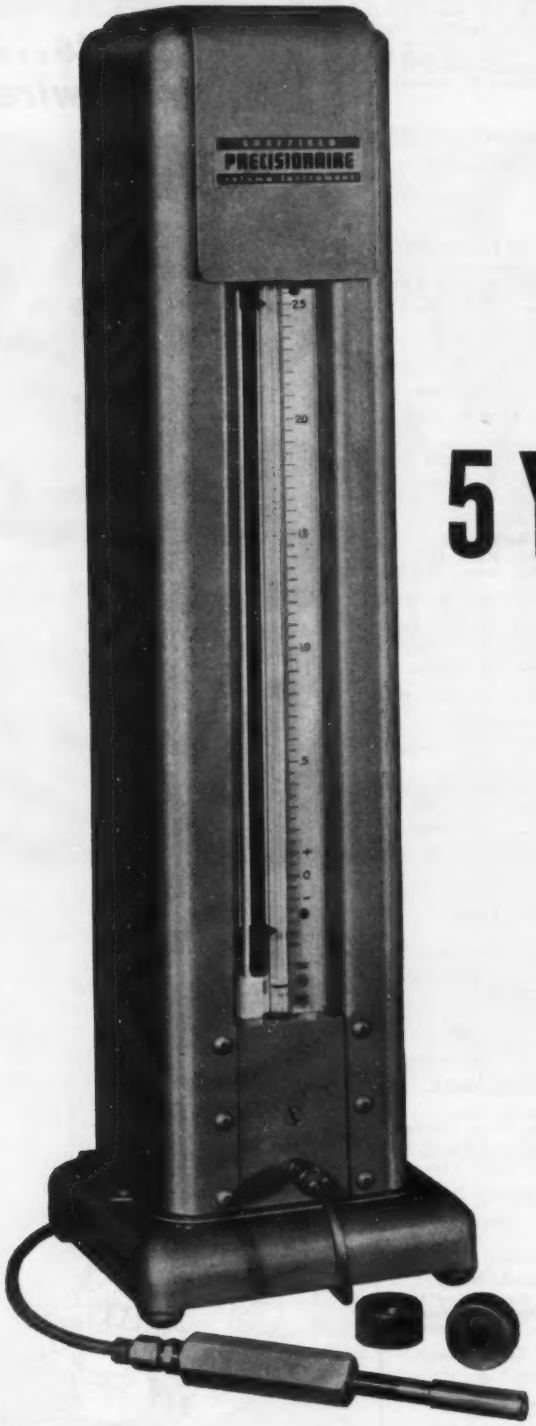
model Q tracer lathe features

- "Dial Your Set-up System" simplifies changeover.
- Multiple tools rough and tracer tools finish turn in one automatic cycle.
- Mechanical feed to all carriages.
- Templates clear of chip area.
- Easy to load and unload.
- Straight line diameter adjustment for tracer tools.
- Four speed headstock available with automatic speed change.
- Feed rate can change during cutting cycle.

SENECA FALLS MACHINE — ENGINEERED FOR PROFIT

DO tell us your troubles. If turning, centering or automation are involved, most likely we can do more than sympathize

SENECA FALLS, MACHINE CO.
SENECA FALLS, N. Y.



New Long-Range 15″ Precisionaire® Column Instrument Now backed by

5 Year Warranty

For all cost-conscious gage buyers, Sheffield's new 5-year Quality and Reliability Warranty on Precisionaire Column Instruments shipped with Sheffield gaging tooling is important news. In addition, 15″ Precisionaire Column Instruments are now supplied in multi-column models, with 5000 to 1 and 10,000 to 1 amplifications. (Higher amplifications up to 100,000 to 1 obtained with Super-Amp Package.)

This instrument doubles gaging range, cuts initial gage cost, reduces gage inventory and upkeep.

You can inspect wider part tolerances at higher amplification with greater accuracy and speed.

You can classify parts into more size increments with a wider scale spread for each class—fewer borderline cases.

You can better control in-process gaging because of greater approach or "come-up" range.

Amplification of Plunjet® gaging cartridges is doubled and full amplification is obtained when gaging small diameters.

Call your local Sheffield representative for a demonstration or write Dept. 9.

The **SHEFFIELD** *Corporation* *Dayton 1, Ohio*

A subsidiary of The Bendix Corporation

Gages, Measuring Instruments, Automatic Gaging & Assembly Systems • Machine Tools • Contract Mfg.

For more data circle this page number on card at back of book

Engineers! Designers!

10 IMPORTANT REASONS

Why You'll like

Gusher

COOLANT PUMPS

SIMPLE, COMPACT DESIGN with no *metal-to-metal contact in the pump.*

ELECTRONICALLY AND DIAMETRICALLY BALANCED ROTATING ASSEMBLY *increases bearing life—eliminates vibration.*

NO SEALS, NO PRIMING — *saves time.*

STREAMLINED APPEARANCE, *hand buffed finish.*

DELIVERS INSTANTANEOUS, COPIOUS COOLANT FLOW *the minute the machine is started.*

HEAVY-DUTY PRECISION BALL-BEARINGS *insure longer life.*

SHAFT IS ONE PIECE, *heavy duty construction, no couplings.*

PRE-LUBRICATED BALL BEARINGS *require no further attention.*

NO PACKING *or adjusting required.*

BALANCED THRUST *is obtained by using equalized pumping action.*

Model 11025

THE Ruthman MACHINERY CO.

• COOLANT PUMPS
• CIRCULATORS • AGITATORS
• MOLTEN METAL PUMPS

1807 Reading Rd. • Cincinnati 2, Ohio

For more data circle Item 294A on Card

MICROMETERS, Outside, Inside, Depth

Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
DoALL Co., Des Plaines, Ill.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Slocomb, J. T. Co., Glastonbury, Conn.
Van Keuren Co., 176 Waltham St., Watertown 72, Mass.

MICROSCOPES, Toolmakers'

DoALL Co., Des Plaines, Ill.
Opto-Metric Tools, Inc., 137 Varick St., New York, N. PY.
Scherr, George, Co., Inc., 200 Lafayette St. New York 12, N. Y.

MILLING MACHINE ATTACHMENTS

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Div., 2011 Eastern Ave., Cincinnati 2, Ohio
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Kearney & Trecker Corp., 6784 W. National Milwaukee 14, Wis.
Nichols, W. H. Co., Waltham 54, Mass.
Sheldon Mch. Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill.
Van Norman Machine Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Automatic

Austin Industrial Corp., White Plains, N. Y.
Buhr Machine Tool Co., 839 Greene St., Ann Arbor, Mich.
Consolidated Machine Tool Carp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7 Mich.
Ingersoll Milling Machine Co., 505 Fulton Ave., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Marac Machinery Corp., Yonkers, N. Y.
Nichols, W. H. Co., Waltham 54, Mass.
Olivetti Corp. of America, 42-33 Northern Blvd., Long Island City 1, N. Y.
Onsrud Machine Works, Inc., Niles, Ill.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Snyder Corp., 3400 E. Lafayette Ave., Detroit 24, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, E. Orange, N. J.

MILLING MACHINES, Bed Type, Simplex Duplex

Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.
Ingersoll Milling Machine Co., 505 Fulton Ave., Rockford, Ill.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Motch & Merryweather Mchy. Co., 888 E. 70th St., Cleveland 3, Ohio
Nichols, W. H. Co., Waltham 54, Mass.
Olivetti Corp. of America, 42-33 Northern Blvd., Long Island 1, N. Y.
Onsrud Machine Works, Inc., Niles, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, E. Orange, N. J.
Van Norman Machine Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Bench, Hand

Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Hardinge Bros. Inc., 1420 College Ave., Elmira, N. Y.

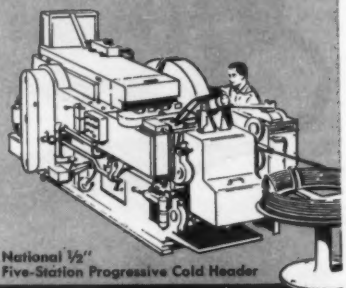
MILLING MACHINES, Circular, Continuous

Consolidated Mch. Tool Carp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Ingersoll Milling Machine Co., 505 Fulton Ave., Rockford, Ill.
Nichols, W. H. Co., Waltham 54, Mass.
Olivetti Corp. of America, 42-33 Northern Blvd., Long Island City 1, N. Y.
Snyder Tool & Engrg. Co., 3400 E .Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2351 11th St., Rockford, Ill.

These important parts are cold-formed from coiled wire, start to finish in compact, efficient National Cold Headers.

The top three are formed with no scrap loss, ready to use! All six achieve remarkable savings over past methods.

If you make odd-shaped parts, may we help you evaluate them for cold-forming from wire? Better yet, come to Tiffin, witness our demonstrations and let's discuss your work.



National ½" Five-Station Progressive Cold Header

NATIONAL MACHINERY CO.

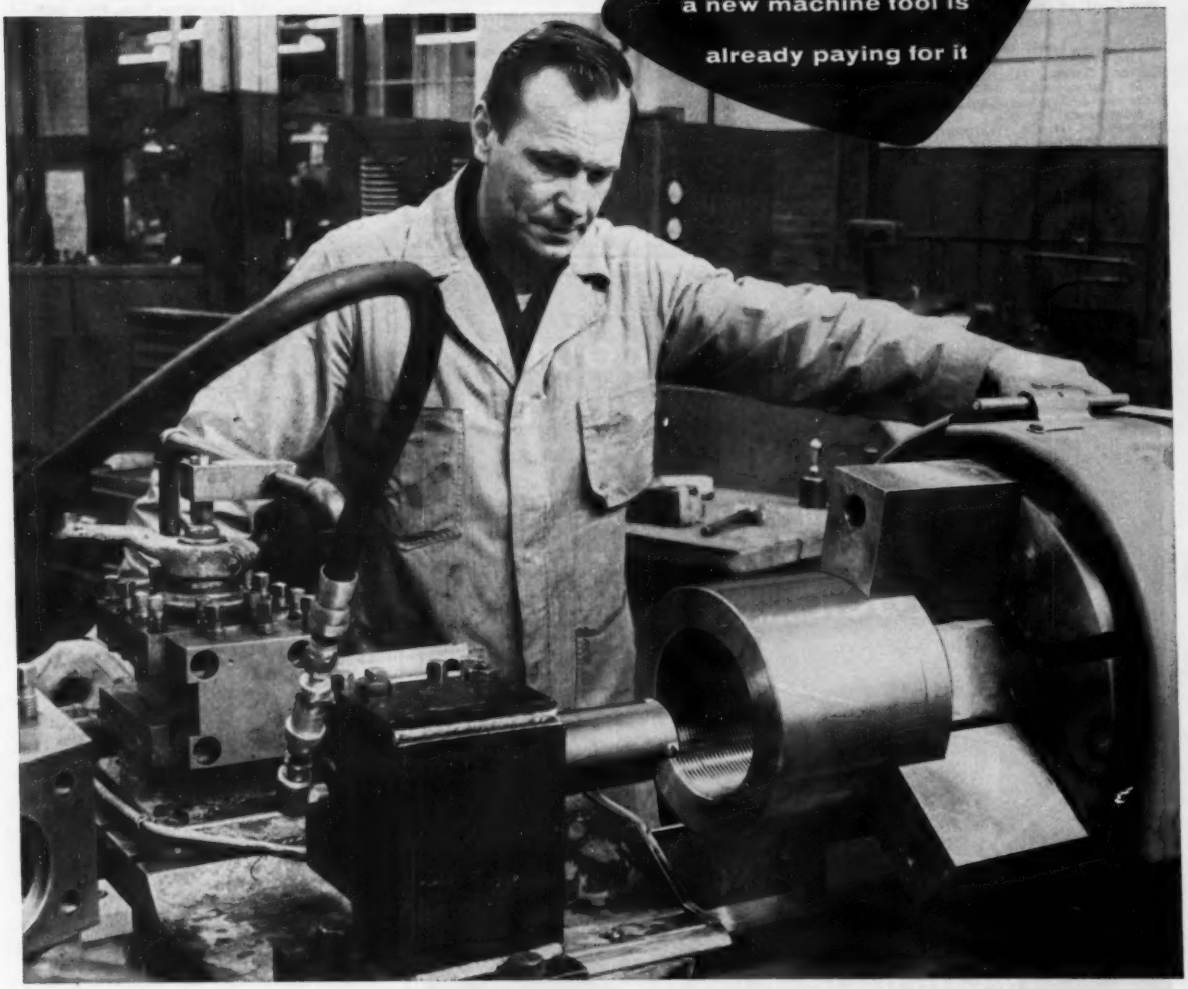
TIFFIN, OHIO, U.S.A.

HARTFORD DETROIT CHICAGO

For more data circle Item 294B on Card

JONES & LAMSON TURRET LATHES

the man who needs a new machine tool is already paying for it



Single point threading to a finish of 15-20 RMS is completely automatic–and fast

The I. D. of these large cap-nuts is approximately 5¼". The material is High Chrome Nickel Steel, Rockwell C 30–32. The thread is 8 pitch, 5 ½" long, *and tapered .005" per inch.*

It's a tough job to make time on, but a J & L Turret Lathe equipped with an Auto-Threader, does the threading in 5 minutes!

Here's how: The part is faced and a rectifying bore is made; in the same chucking, threading is completed in 16 automatically-controlled passes, with a graduated cutting depth for each pass. *Pitch diameter is held to .002",* and finish is 15–20 RMS on the flanks.

On the old machine, milling the thread alone took 75 minutes. With this new setup, the entire operation — including loading, facing, boring, threading and unloading — is only 15 minutes.

Jones & Lamson Turret Lathes are available with: Completely automatic controls; 45°, 60°, and 180° Tracers; taper attachments, and a variety of other tooling complements, all designed to increase productivity.

Write for detailed information, Jones & Lamson Machine Company, 512 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

For more data circle this page number on card at back of book

MILLING MACHINES, Die Sinking, Duplicating, Profiling

Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Elox Corp. of Michigan, Troy, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Kearney & Trecker Corp., 6784 W. National Milwaukee 14, Wis.
Nichols, W. H. Co., Waltham 54, Mass.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Knee Type, Horizontal, Plain, Universal

Austin Industrial Corp., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Bridgeport 6, Conn.
Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Clearing Div., of U.S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton Geo., Mch., Co., 1110 W. 13th St., Racine, Wis.
Greaves Machine Tool Div., 2009 Eastern Ave., Cincinnati, Ohio
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.
Ingersoll Milling Machine Co., 505 Fulton Ave., Rockford, Ill.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Nichols, W. H. Co., Waltham 54, Mass.
Onsrud Machine Works, Inc., Niles, Ill.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.

MILLING MACHINES, Knee Type Ram

Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Gorton Mch. Co., 1321 Racine St., Racine, Wis.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Van Norman Machine Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Knee Type Rise and Fall

Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Nichols, W. H. Co., Waltham 54, Mass.
Orban, Kurt Co., 42 Exchange Place, Jersey City, N. J.

MILLING MACHINES, Knee Type Turret

Gorton Mch. Co., 1321 Racine St., Racine, Wis.

MILLING MACHINES, Knee Type, Vertical

Austin Industrial Corp., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Cosa Corp., 490 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Nichols, W. H. Co., Waltham 54, Mass.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

MILLING MACHINES, Planer Type

Berthiez, Charles, 5 Rue Montalivet, Paris, France
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn R.R., Evanston, Cincinnati, Ohio
Hamilton Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio
Ingersoll Milling Machine Co., 505 Fulton Ave., Rockford, Ill.
Kearney & Trecker, Corp., 6784 W. National, Milwaukee 14, Wis.
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City, N. J.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Spar

Cincinnati Milling Machine Co., Special Machine Div., Marburg Ave., Cincinnati 9, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Hamilton Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Onsrud Machine Works, Inc., Niles, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Thread

Pratt & Whitney Co., Inc., W. Hartford, Conn.
Wickes Mch. Tool Div., Wickes Corp., Saginaw, Mich.

MOLDING MACHINES, Plastic

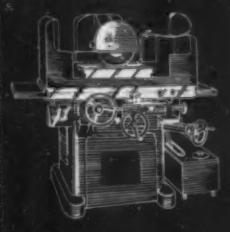
Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.

MOTORS, Electric

Brook Motor Corp., 3302 W. Peterson Ave., Chicago 45, Ill.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland 17, Ohio
Onsrud Machine Works, Inc., Niles, Ill.
Reliance Electric & Engrg. Co., 1200 Ivanhoe Rd., Cleveland 10, Ohio

MOTORS, Hydraulic

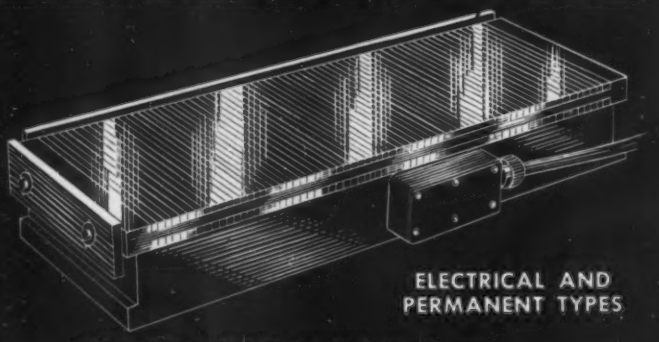
Barnes, John S. Corp., Rockford, Ill.
Denison Engineering Div. American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hydraulic Press Mfg. Div., Mt. Gilead, Ohio
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.



YOU CAN COUNT ON EVEN GREATER PRODUCTIVITY

from your new machine when it comes with a

MAGNA-LOCK MAGNETIC CHUCK



ELECTRICAL AND PERMANENT TYPES

- Noted For Their Extra Holding Power
- Exclusive Fine-Laminated or New Fine-Grid Types
- Sizes From 5" x 10" To Meet Every Need
- Rectangular and Swiveling — Rotary Models Also Available

Users know – and machine builders, too – a Magna-Lock chuck is a "natural" for a fine machine tool. When you order your new machine, specify it equipped with a Magna-Lock chuck – leading machine tool builders recommend and furnish Magna-Lock. Want details? Write today, Dept. MH59.

Hanchett MAGNA-LOCK CORPORATION

BIG RAPIDS, MICHIGAN, U.S.A. - Telephone 815

Electrical and permanent magnet chucks, sine chucks, parallels, V-blocks, top plates, Magna-Vise

Vickers Inc., Administrative & Engineering Center, Box 302, Detroit 32, Mich.

MULTIPLE INSPECTION GAGES—See Gages, Multiple Inspection

MULTIPLE STATION MACHINES, Dial Type

Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Baush Mch. Tool Co., 15 Wason Ave., Springfield, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport 5, Conn.
Buhr Machine Tool Co., 839 Greene St., Ann Arbor, Mich.
Cincinnati Milling Machine Co., Special Machine Div., Marburg Ave., Cincinnati 9, Ohio
Cross Co., P. O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Greenlee Bros. & Co., 2136 12th St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
National Automatic Tool Co., S. 7th N. St., Richmond, Ind.
Snyder Corp., 3400 E. Lafayette Ave., Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

MULTIPLE-STATION MACHINES, Transfer Type

Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Baush Mch. Tool Co., 15 Wason Ave., Springfield, Mass.
Buhr Mch. Tool Co., 839 Green St., Ann Arbor, Mich.
Bullard Co., Bridgeport 6, Conn.
Cincinnati Milling Machine Co., Special Machine Div., Marburg Ave., Cincinnati 9, Ohio
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Cross Co., P. O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.
Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Greenlee Bros. & Co., 2136 - 12th St., Rockford, Ill.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Moline Tool Co., 102-20th St., Moline, Ill.
National Automatic Tool Co., S. 7th N. Sts., Richmond, Ind.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Snyder Corp., 3400 E. Lafayette Ave., Detroit 7, Mich.
Sundstrand Mch., Tool Co., 2531 11th St., Rockford, Ill.
Waterbury Farrel Foundry & Mach. Co., Waterbury, Conn.

NIBBLERS, Portable Pneumatic

Buckeye Tools Corp., Dayton, Ohio

NIBBLING MACHINES

American Pullmax Co., Inc., 2455 N. Sheffield Ave., Chicago 14, Ill.
Wales-Strippit, Inc., Akron, N. Y.

NICKEL & NICKEL ALLOYS

Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.

NUMERICAL CONTROL SYSTEMS—See Electronic Control Systems

NUT SETTERS—See Screwdrivers, etc.

NUTS—See Bolts, Nuts and Screws

OIL GROOVERS

Wicaco Machine Corp., Wayne Junction, Philadelphia 44, Pa.

OILERS AND LUBRICATORS

Madison-Kipp Corp., Madison, Wis.
Wicaco Machine Corp., Wayne Junction, Philadelphia 44, Pa.

OILS, CUTTING SOLUBLE—See Cutting and Grinding Fluids

OILS, Lubricating—See Lubricating Oils and Greases

OILS, Quenching and Tempering

Cities Service Oil Co., 70 Pine St., New York N. Y.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 - 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80, Ill.

OPTICAL FLATS

DoALL Co., Des Plaines, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Van Keuren Co., 176 Waltham St., Watertown 72, Mass.

PAINTING EQUIPMENT, Spray—See Spraying Equipment, Metal

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I.
DoALL Co., Des Plaines, Ill.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

PILLOW BLOCKS

S K F Industries, Inc., Philadelphia, Pa.

PIPE, Steel, Stainless, etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

(Continued on page 298)

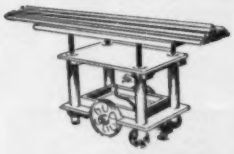
5603

NOW!

NEW *Convenience*
NEW *Capacities*
NEW *Designs*

PORTELVATOR®

The Handy HAMILTON Portable, Elevating Table



NEW provision for increasing table area!

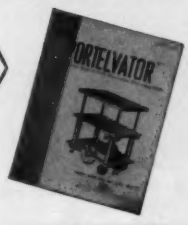
NEW provision for raising and lowering overhanging loads!

NEW convenience in maneuvering! Six wheel models roll easier . . . turn shorter.

NEW overhanging conveyor tops!

More stamina, more versatile performance than ever before

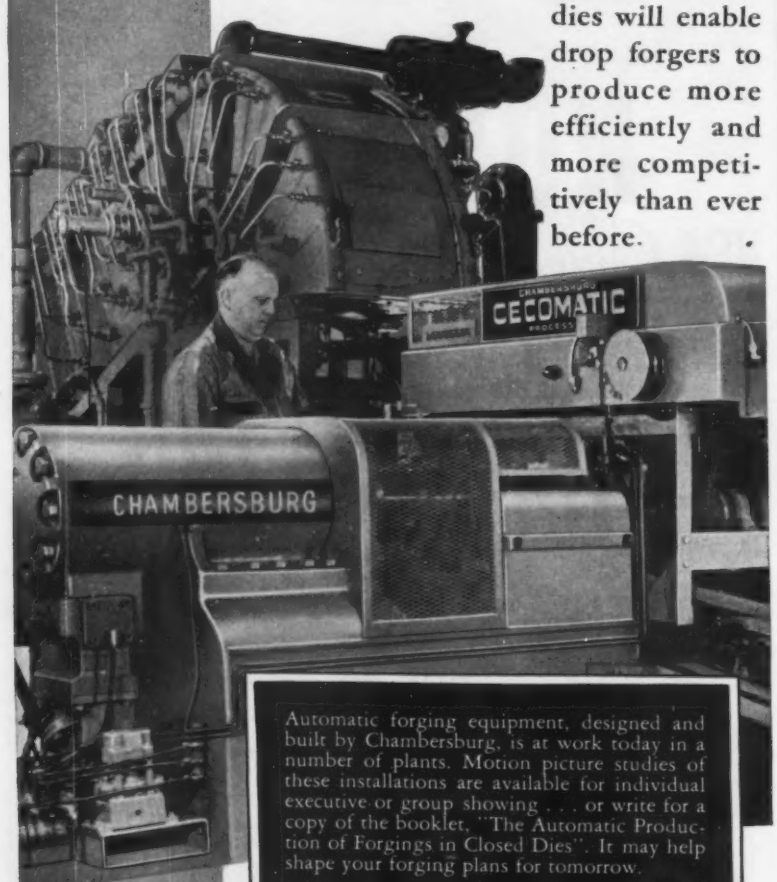
NEW FREE LITERATURE illustrates and describes all! Write for Bulletin P-5603. Address, The Hamilton Tool Company, 834 South Ninth Street, Hamilton, Ohio.



For more data circle this page number on card at back of book

Mechanized drop forging will change your future!

The cost-cutting advantages of the automatic production of forgings in closed dies will enable drop forgers to produce more efficiently and more competitively than ever before.



Automatic forging equipment, designed and built by Chambersburg, is at work today in a number of plants. Motion picture studies of these installations are available for individual executive or group showing . . . or write for a copy of the booklet, "The Automatic Production of Forgings in Closed Dies". It may help shape your forging plans for tomorrow.

CHAMBERSBURG ENGINEERING COMPANY
Chambersburg Pennsylvania

CHAMBERSBURG

• The Hammer Builders •

DESIGNERS AND MANUFACTURERS OF THE IMPACTER

When it's a vital part, design it to be FORGED

Babcock & Wilcox Co., Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Ryerson, Joseph T. & Son, Inc., 16th & Rockwell Sts., Chicago 8, Ill.
United States Steel Corp., National Tube Co. Div., 436 7th Ave., Pittsburgh, Pa.

PIPE AND TUBING MILLS, Electric-weld

Yoder Co., 5504 Walworth Ave., Cleveland 2, Ohio

PIPE AND TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York 17, N. Y.

PIPE THREADING AND CUTTING MACHINES

Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.
Landis Machine Co., Inc., Waynesboro, Pa.
Sheffield Corp., Box 893, Dayton 1, Ohio

PLANER JACKS—See Set-up Equipment

PLANERS, Double Housing and Openside

Berthiez, Charles, 5 Rue Montalivet, Paris, France
Consolidated Mch. Tool Div., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A. Co., 3611 Woodburn Ave., Cincinnati, Ohio
Hamilton Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio
Lapointe Machine Tool Co., Hudson, Mass.
Orban Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

PLASTICS AND PLASTIC PRODUCTS

Eastman Kodak Co., 343 State St., Rochester 4, N. Y.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
U. S. Steel Corp., Nat'l Tube Div., Pittsbugh, Pa.

PRESS BRAKES—See Brakes, Press and Bending

PRESS FEEDERS, Automatic

Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Federal Press Co., 511 Division St., Elkhart, Ind.
Precision Welder & Flexopress Corp., 3518 Ibsen Ave., Cincinnati 9, O.
U. S. Tool Co., 255 N. 18th St., Ampere, East Orange, N. J.

PRESSES, Arbor

Birdsboro Corp., Birdsboro, Pa.
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Famco Machine Co., Kenosha, Wis.
Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.
Logansport Machine Co., Inc., Logansport, Ind.
Threadwell Tap & Die Corp., 16 Arch St., Greenfield, Mass.
Wilson, K. R., Inc., Arcade, N. Y.

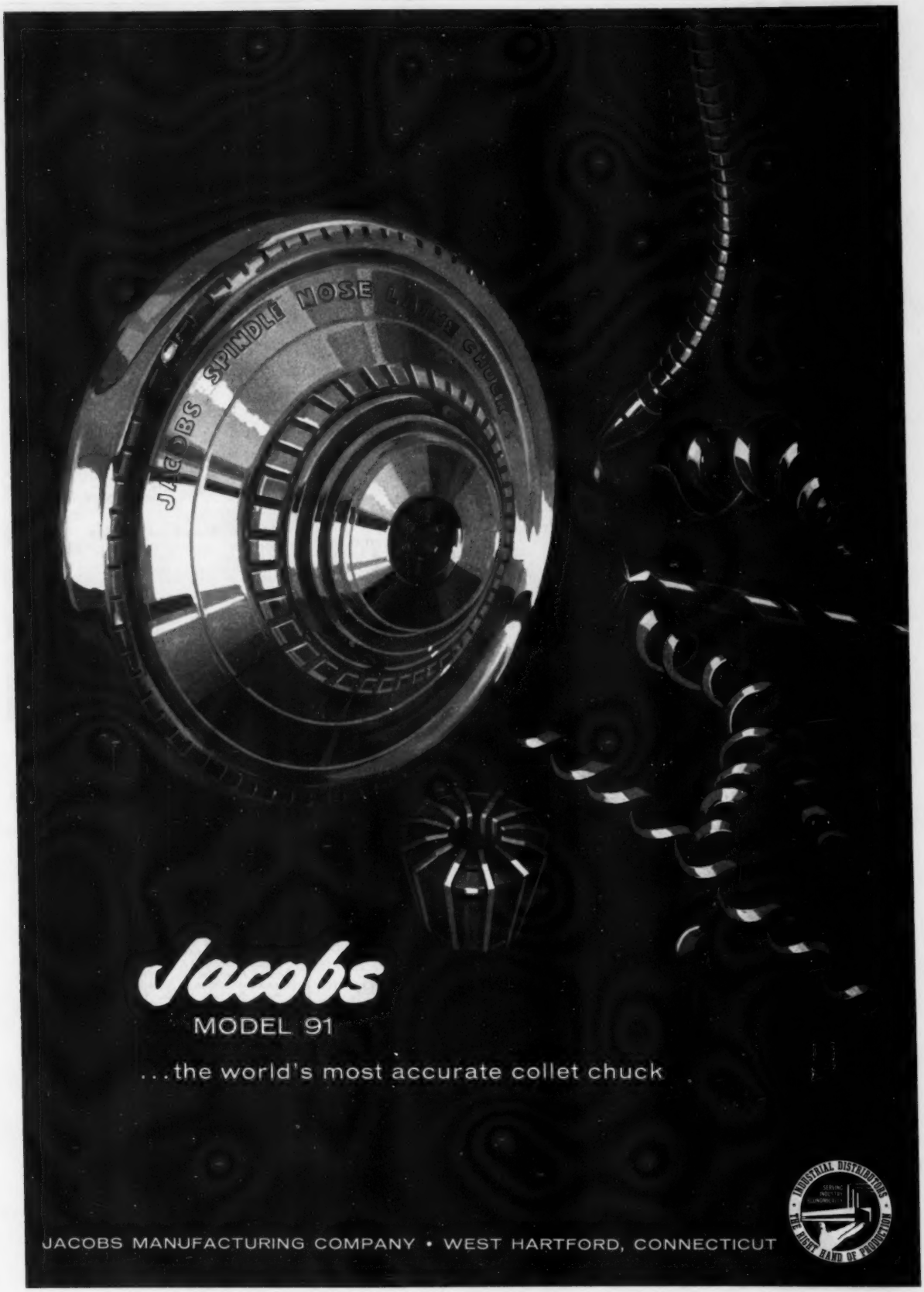
PRESSES, Assembling

Allen, Alva Industries, Clinton, Mo.
Bliss, E. W. Co., 1375 Raff. Rd., S.W., Canton, Ohio
Denison Engineering Div., American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Erie Foundry Co., 1253 W. 12th St., Erie, Penna.
Federal Press Co., 511 Division St., Elkhart, Ind.
Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Northern Hydraulics & Mach. Corp., Melrose Park, Ill.

PRESSES, Blanking, Stamping

Allen, Alva Industries, Clinton, Mo.
Birdsboro Corp., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd., S.W., Canton, Ohio

(Continued on page 300)


JACOBS SPINDLE NOSE
Jacobs
MODEL 91
...the world's most accurate collet chuck
INDUSTRIAL DISTRIBUTORS
THE RIGHT HAND OF PRODUCTION
JACOBS MANUFACTURING COMPANY • WEST HARTFORD, CONNECTICUT

Announcing the Van Keuren

THREAD RING COMPARATOR

It does the job FASTER and EASIER than rings AT LESS COST

If you use THREAD RING GAGES in your production line, the new VAN KEUREN THREAD RING COMPARATOR will dispense with many gages and much labor cost — in providing quick, accurate and repetitive measurements.

The Van Keuren Thread Ring Comparator is a production gage for checking external threads up to ¾" diameter.

Gages both full form and pitch diameter • Sets and checks quickly

Gives uniform results. Repeats to .0002" • Long lasting — has no pivots

Write for descriptive literature or call your nearest Van Keuren representative for demonstration. Literature is available covering our full line of Thread Gages and other measuring equipment.

VK

THE Van Keuren CO.

Since 1920

178 Waltham Street, Watertown 72, Mass.

PRECISION MEASURING TOOLS

. . . rated the world's most accurate

Plug Gages · Measuring Wires · Optical Flats and Light Wave Equipment · Gage Blocks · Precision Lapping Service and Parts

Chambersburg Engineering Co., Chambersburg, Pa.
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engineering Co., Wickliffe, Ohio
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio
Danly Machine Specialties, Inc., 2100 South Laramie, Chicago 50, Ill.
Denison Engineering Div. American Brake Shoe Co., 152 Dublin Rd., Columbus 16, Ohio
Federal Machine and Welder Co., Warren, Ohio
Federal Press Co., 511 Division St., Elkhart, Ind.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Precision Welder & Flexopress Corp., 3518 Ibsen Ave., Cincinnati 9, O.
U. S. Tool Co., Inc., 255 N. 8th St., Ampere, East Orange, N. J.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Waterbury Farrel Foundry & Mach., Co., Waterbury, Conn.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Briquetting

Birdsboro Corp., Birdsboro, Pa.
Denison Engineering Div., American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Hydraulic Press Mfg., Co., Mount Gilead, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Closed-Die Forging

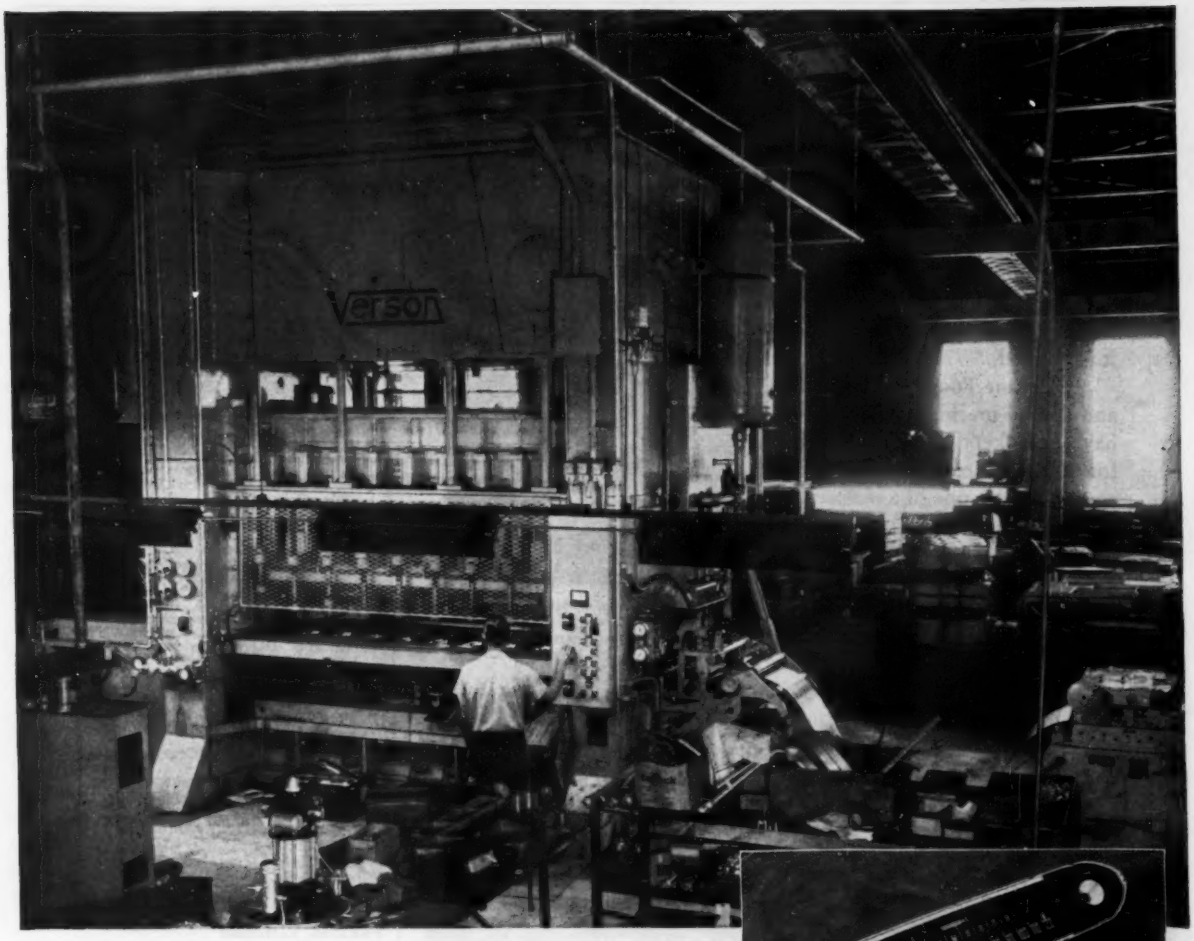
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland 17, Ohio
Birdsboro Corp., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd., S.W., Canton, Ohio
Chambersburg Engineering Co., Chambersburg Pa.
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Erie Foundry Co., 1253 W. 12th St., Erie, Penna.
Hydraulic Press Mfg. Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Lake Erie Machinery Corp., 370 Woodward Ave., Buffalo 17, N. Y.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Coining, Embossing

Birdsboro Corp., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Chambersburg Engineering Co., Chambersburg, Pa.
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave. Cleveland 14, Ohio
Danly Machine Specialties Inc., 2100 South Laramie, Chicago 50, Ill.
Denison Engineering, Div. American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Federal Machine and Welder Co., Warren, Ohio
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave. Chicago 19, Ill.
Waterbury Farrel Foundry & Mach. Co., Waterbury, Conn.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Die Sinking (Hobbing)

Birdsboro Corp., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Chambersburg Engineering Co., Chambersburg, Pa.
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Erie Foundry Co., 1253 W. 12th St., Erie, Penna.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Waterbury Farrel Foundry & Mach. Co., Waterbury, Conn.
Wilson, K. R., Inc., Arcade, N. Y.



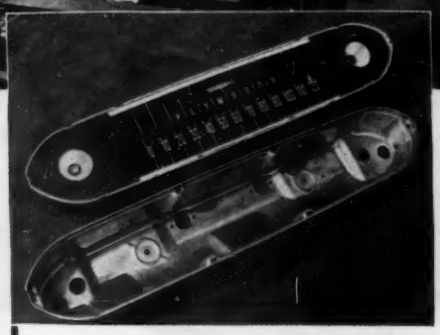
—Verson— TRANSMAT PRESS

Cuts Costs, Improves Production for Stewart-Warner Corporation

From coil stock, this 300 ton Verson Transmat Press produces 1200 automotive speedometer housings per hour automatically for Stewart-Warner Corporation, Chicago, Ill.

The press performs seven operations on the piece which measures 18″ long x 3¼″ wide x 2⁹⁄₁₆″ in height in the finished form. The press utilizes a mechanically actuated Transmat feed for automatically handling the stamping through all die stations. The feed is protected, in event of an overload, by safety slip clutches on the power take-off shaft and on the feed bar finger racks.

The press is equipped with an *Alemite* grease lubrication system for counterbalance and knockout rods and cushion guides. An *Alemite* automatic oil lubrication system handles the counterbalance, knockout and cushion packings.



THE TRANSMAT CONCEPT

If you must produce 4000 or more identical stampings daily which require four or more operations, Verson Transmat Presses offer you the opportunity to slash production costs. If any of your production requirements fall in this category, send an outline of your requirements for specific information.

Originators and pioneers of allsteel stamping press construction

VERSON ALLSTEEL PRESS CO.

TRADE Verson MARK

235

9309 S. Kenwood Avenue, Chicago 19, Illinois • 8300 S. Central Expressway, Dallas, Texas

MANUFACTURERS OF MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES
TRANSMAT PRESSES • IMPACT MACHINING PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES • HYDRAULIC SHEARS

For more data circle this page number on card at back of book

THERE HAS ALWAYS BEEN

One Outstanding Name

IN FRESH OIL LUBRICATION...

MADISON-KIPP

Fresh Oil Lubrication is automatic, closely measured, constantly fed new oil under pressure for each friction surface to which it is applied.

Machine Tools, Compressors and special machines of all kinds have been kept in top condition for 20 or 30 years or more when equipped with one of 6 models of Madison-Kipp Lubricators.

The Model OL—one of the 6 Models of Madison-Kipp Lubricators.

kipp

MADISON-KIPP CORPORATION
203 WAUBESA STREET • MADISON 10, WIS., U.S.A.

Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

For more data circle Item 302A on Card

MACHINERY'S HANDBOOK

NEW 16th Edition — 1959

ENLARGED — 192 pages added

REVISED — over 500 completely new pages of information

The most frequently used reference for design and manufacturing data. For 45 years "The Bible of the Mechanical Industries." Over 1,250,000 copies sold

$11.00

Latest, most accurate data . . . The proven information you need. Covers the principles, practices and up-to-date standards of design and manufacture you use every day on the job.

Compact, convenient, comprehensive . . . The 2104 pages of MACHINERY's Handbook put the facts at your fingertips in one easy-to-use, thumb-indexed volume.

Order your copy today!

THE INDUSTRIAL PRESS, 93 Worth St., New York 13, N. Y.

☐ Please send me _____ copies of The 16th Edition of MACHINERY's Handbook.
☐ Enclosed is full payment. (Add 50¢ for orders outside U. S. & Canada)
☐ Send under 5-day free inspection plan (U. S. and Canada only).
☐ Please send me more information.

Name_____

Address_____ City_____ State_____

PRESSES, Die Tryout
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Erie Foundry Co., 1253 W. 12th St., Erie, Penna.
Federal Machine and Welder Co., Warren, Ohio
Federal Press Co., 511 Division St., Elkhart, Ind.
Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Drawing
Allen, Alva Industries, Clinton, Mo.
Birdsboro Corp., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engineering Co., Wickliffe, Ohio
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio
Danly Machine Specialties Inc., 2100 South Laramie, Chicago 50, Ill.
Denison Engineering, Div. American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Erie Foundry Co., 1253 W. 12th St., Erie, Penna.
Federal Machine and Welder Co., Warren, Ohio
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Waterbury Farrel Foundry & Mach. Co., Waterbury, Conn.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Extrusion
Birdsboro Corp., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Danly Machine Specialties Inc., 2100 South Laramie, Chicago 50, Ill.
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Federal Machine and Welder Co., Warren, Ohio
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Foot
Famco Machine Co., Kenosha, Wis.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Producto Machine Co., 985 Housatonic Ave., Bridgeport 1, Conn.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Waterbury Farrel Foundry & Mach. Co., Waterbury, Conn.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Horning
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Federal Machine and Welder Co., Warren, Ohio
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

this modern

CLEVELAND PRESS

embodies every essential feature for

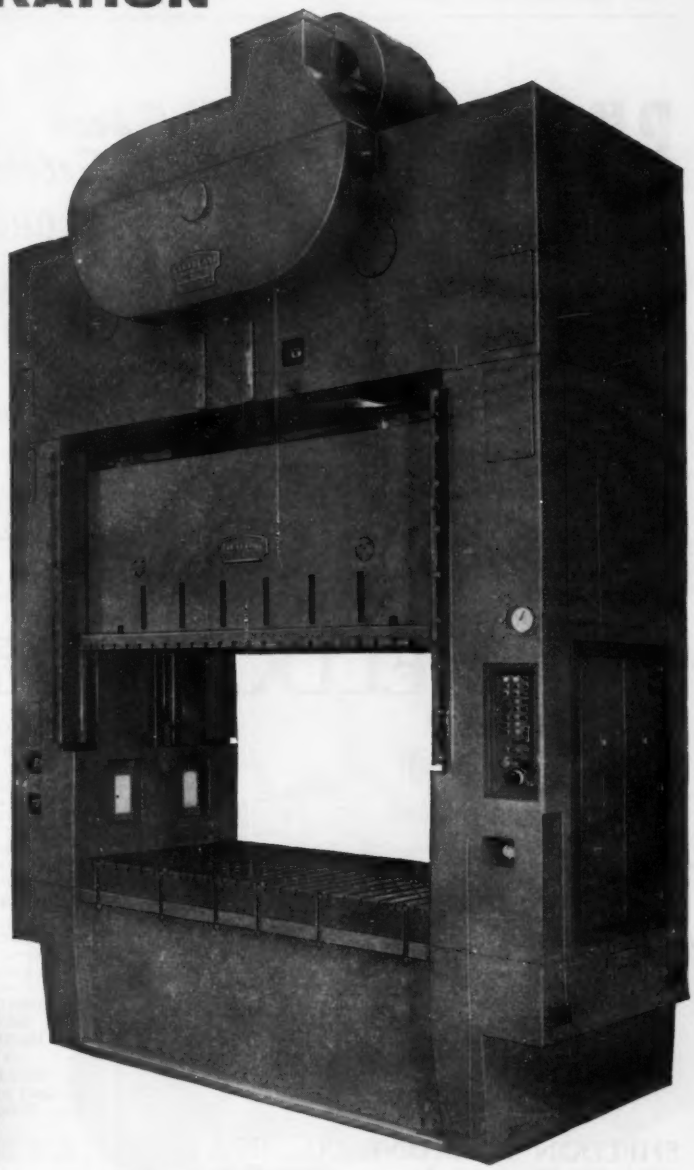
EFFICIENT OPERATION

Designed to produce many different types of stampings, this modern Cleveland Four Point Press already has proven its cost-cutting efficiency in automotive, appliance and other industrial pressrooms.

Features on this press are:

- Electrically controlled air-operated Cleveland (patented) Drum Type Clutch with spring loaded brake
- Air counterbalanced slide
- Pneumatic cushion in the bed, with controls for separate operation
- Auxiliary air brake on flywheel
- Lighted die area
- Gears completely enclosed, spray lubricated
- Stroke indicator
- Built to JIC Standards

Cleveland Four Point Presses can be furnished in a wide range of sizes, with capacities to suit particular requirements by modifying the stroke, adjustment, bed and slide areas. All models have this in common — maximum accuracy and die life . . . minimum maintenance and per-part costs . . . that's why it pays you to look into the advantages Cleveland Presses offer.



500-ton capacity, 24" stroke with 15" adjustment; shut-height 61½"; slide and bed both 72" x 144".

THE CLEVELAND PUNCH & SHEAR WORKS CO.
Established 1880

Power Presses
Fabricating Tools
Punching Tools & Dies

E. 40th and St. Clair Avenue, Cleveland 14, Ohio

A-1518A

For more data circle this page number on card at back of book

PRESSES, Notching

Allen, Alva Industries, Clinton, Mo.
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Federal Machine and Welder Co., Warren, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Wales-Strippit, Inc., Akron, N. Y.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Punching, Piercing

Allen, Alva Industries, Clinton, Mo.
Beatty Machine & Mfg. Co., Hammond, Ind.
Birdsboro Corp., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engineering Co., Wickliffe, Ohio
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio
Danly Machine Specialties Inc., 2100 South Laramie, Chicago 50, Ill.
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Famco Machine Co., Kenosha, Wis.
Federal Machine and Welder Co., Warren, Ohio
Federal Press Co., 511 Division St., Elkhart, Ind.
Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.
L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Precision Welder & Flexopress Corp., 3518 Ibsen Ave., Cincinnati 9, O.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Wales-Strippit, Inc., Akron, N. Y.
Waterbury Farrel Foundry & Mach. Co., Waterbury, Conn.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Quenching

Gleason Wks., 1000 University Ave., Rochester 3, N. Y.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.

PRESSES, Rubber-Forming

Birdsboro Corp., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Chambersburg Engineering Co., Chambersburg, Pa.
Cincinnati Milling Machine Co., Meta-Dynamics Div., Cincinnati 9, Ohio (Hydroform)
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Erie Foundry Co., 1253 W. 12th St., Erie, Penna.
Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9303 S. Kenwood Ave., Chicago 19, Ill.
Wilson, K. R., Inc., Arcade, N. Y.

PRESSES, Trimming

Allen, Alva Industries, Clinton, Mo.
Beatty Machine & Mfg. Co., Hammond, Ind.
Birdsboro Corp., Birdsboro, Pa.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
B-T Machinery Co., Holland, Mich.
Chambersburg Engineering Co., Chambersburg, Pa.
Clearing Div., of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio
Danly Machine Specialties Inc., 2100 South Laramie, Chicago 50, Ill.
Denison Engineering Div., American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Erie Foundry Co., 1253 W. 12th St., Erie, Penna.
Federal Machine and Welder Co., Warren, Ohio
Federal Press Co., 511 Division St., Elkhart, Ind.
Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.
Minster Machine Co., Minster, Ohio
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Wilson, K. R., Inc., Arcade, N. Y.

PROFILING MACHINES — See Milling Machines, Die Sinking, etc.

PULLEYS

Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
DoALL Co., Des Plaines, Ill.

PUMPS, Coolant and Lubricant

Barnes, John S., Corp., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
DoALL Co., Des Plaines, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Little Giant Pump Co., Oklahoma City 18, Okla.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 2, Ohio

PUMPS, Hydraulic

Barnes John S., Corp., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Denison Engineering, Div. American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers Inc., Administrative & Engineering Center, Box 302, Detroit 32, Mich.
Wilson, K. R., Inc., Arcade, N. Y.

PUNCHES AND DIES—See Dies, Blanking, etc.

REAMERS, Rose, Chucking, Jobbers Taper, Shell, Adjustable, etc.

Barber-Colman Co., 1300 Rock St., Rockford, Ill.

PUSH BUTTON *Speed Selection*

from to in seconds

or to *any* intermediate speed, *instantly*

Just push a button and watch the large tachometer dial on the headstock!

It's that easy!

The work is done by a motor driven speed changer. It accelerates or slows the lathe to any desired speed in seconds. With a 10:1 ratio, this new variable drive makes it easy to select from a wide range of speeds—200 to 2000 rpm in direct drive and 40 to 300 rpm in back gear.

Maximum stability and smooth power transmission are assured because the drive unit is oversized. All pulleys and shafts are fully supported (eight bearings). Double V-belts throughout the drive eliminate slippage and deliver full power to the spindle. Because of this rigidity and extra pulling power, this lathe will take heavy cuts at all speeds and precision finish cuts at high speeds.

It is a precision lathe, moderate in price, with the versatility for toolroom, production or second operation jobs.

SHELDON *Variable Speed* PRECISION LATHES

See us at ASTE Show Detroit April 21-28 Booth 1727

Illustrated WM56P 13" Swing- 34" Centers

Write for

"Variable Speed" Circular and General Catalog showing . . .

•

10", 11", 13" and 15" SHELDON Precision Lathes (Bench, Pedestal and Cabinet types)

•

13" and 15" SEBASTIAN Geared Head Lathes

•

SHELDON Milling Machines

•

SHELDON Back Geared Shapers

SHELDON MACHINE CO., INC.
4246 N. Knox Ave. • Chicago 41, ILL.

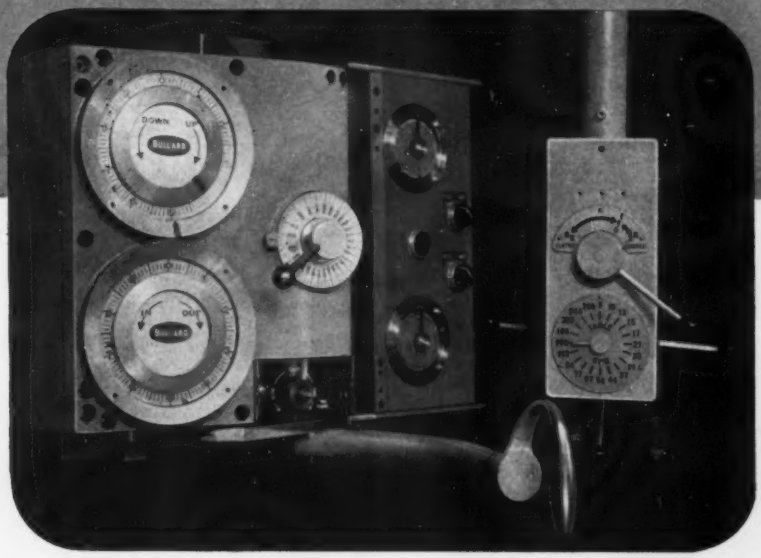
. . . Another First from BULLARD

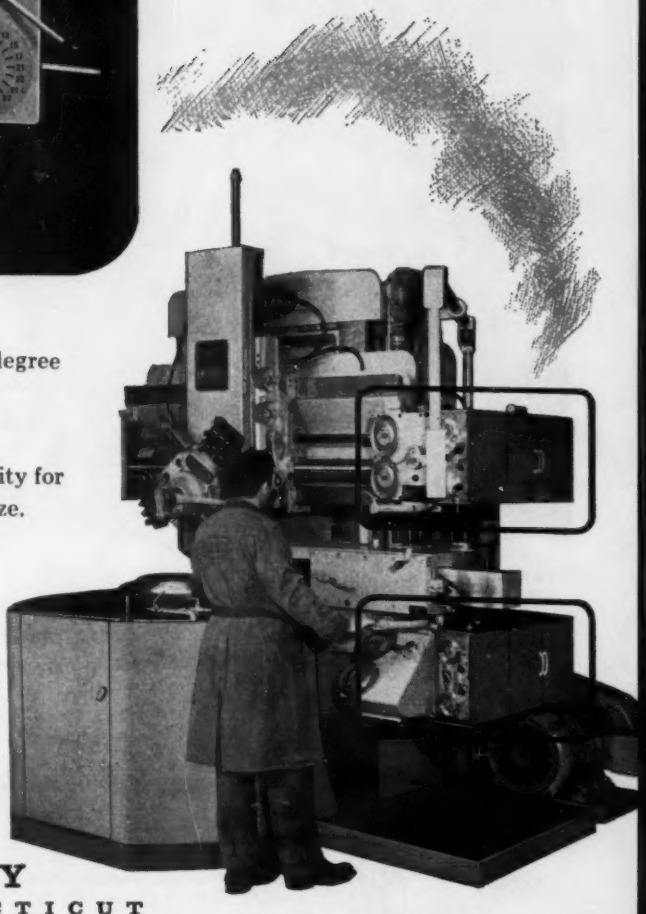
Size-Au-Trol*

revolutionary new feature of

Bullard DYNATROL*

VERTICAL TURRET LATHES





Size-Au-Trol* provides precise tool positioning control to a degree unobtainable with other vertical turret lathes.

Size-Au-Trol* after set-up relieves the operator of the responsibility for sizing the work by insuring consistent control of size.

Size-Au-Trol* repetitively accurate to within .0003, increases productivity by cutting time between cuts.

Size-Au-Trol* is standard equipment on the complete line of Bullard Dynatrol V.T.L.'s.

For information on the completely new Dynatrol* line of vertical turret lathes, contact your nearest Bullard Sales Representative or write

THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT

*Trademark

. . . YOU CAN'T BEAT A BULLARD . . .

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
Cleveland Twist Drill Co., 1242 49th St., Cleveland, Ohio
Cogsdill Twist Drill Co., Greenfield, Mass.
DoALL Co., Des Plaines, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Jarvis Corp., Stack Ave., Middletown, Conn.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Tomkins-Johnson Co., Jackson, Mich.

REELS, Stock
U. S. Tool Co., Inc., 255 North 18th St., Ampere, E. Orange, N. J.

REFRACTORS Heat-Treating Furnaces
Norton Co., 1 New Bond St., Worcester 6, Mass.

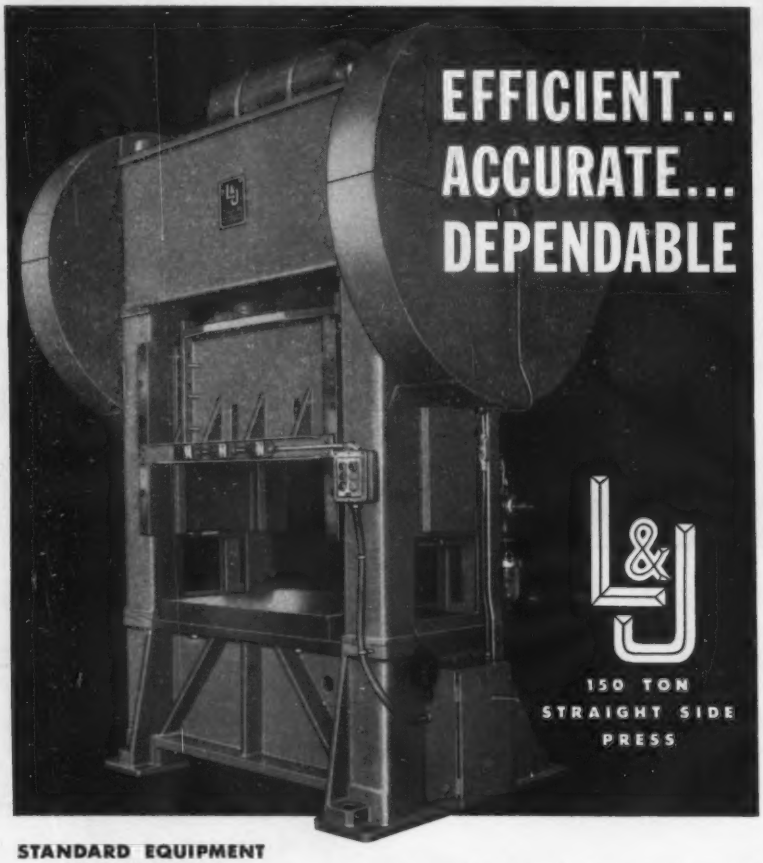
RETAINING RINGS
Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N. Y.

RIVETERS, Portable
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.

RIVETERS, Stationary
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.
Tomkins-Johnson Co., Jackson, Mich.

ROTARY TABLES, Optical
Machine Products Corp., 6771 E. McNichols Rd., Detroit 12, Michigan

RULES, SCALES AND STRAIGHTEDGES
See Machinists' Small Tools



STANDARD EQUIPMENT
ALL HIGH QUALITY

Including—Air clutch. J.I.C. wiring and controls. Shaft driven limit switch. Solenoid-controlled dual air valve. Replaceable wear strips on slide. Hard bronze crankshaft bearings. Replaceable ball seats. Air counter balances on slide. One-shot forced lubrication. Gears run in oil. *Optional equipment as required.*

- **Single geared, twin end drive, double crank.**
- **Maximum quality throughout.**
- **Long, square gibbing maintains perfect slide alignment.**
- **Heavy welded steel box-type frame with tensioned tie rods insures rigidity.**
- **Proven L&J quality gives long, dependable service and cuts maintenance costs.**
- **Large die space — 48" x 36" slide face, 48" x 36" bolster area.**

WRITE for complete information on 20- to 150-ton straight side presses, 14- to 150-ton O.B.I. presses and 30- to 75-ton gap frame presses.

L & J PRESS CORPORATION 1631 STERLING AVE. ELKHART, IND.

RUST INHIBITORS
Oakite Products, Inc., 26 Rector St., New York, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Stuart, D. A. Oil Co., Ltd., 2727 S. Troy St., Chicago 23, Ill.

SAND BLAST EQUIPMENT—See Blast Cleaning Equipment

SAW BLADES, Hack, Band, Circular Friction
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Capewell Mfg. Co., 60 Governor St., Hartford, Conn.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
DoALL Co., Des Plaines, Ill.
Motch & Merryweather Mchy. Co., 888 E. 70th St., Cleveland 3, Ohio

SAW BLADE SHARPENERS
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Motch & Merryweather Mchy. Co., 888 E .70th St., Cleveland 3, Ohio

SAWING MACHINES, Abrasive Machines—See Cutting-off Saws, Abrasive Wheel

SAWING MACHINES, Band
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
DoALL Co., Des Plaines, Ill.
Famco Machine Co., Kenosha, Wis.

SAWING MACHINES, Circular Blade
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Motch & Merryweather Mchy. Co., 888 E. 70th St., Cleveland 3, Ohio
Ty-So-Man Machine Co., Inc., 1093 White Ave., Knoxville, Tenn.

SAWING MACHINES, Power Hack
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Austin Industrial Corp., White Plains, N. Y.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, N. Y.

SAWS, Screw-slotting—See Cutters, Milling

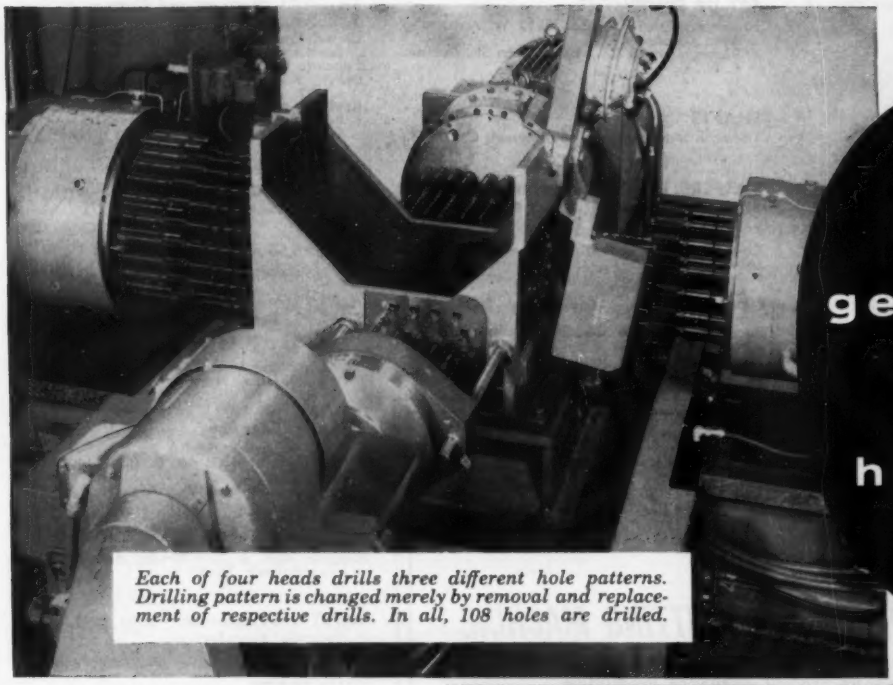
SCREW DRIVERS, STUD AND NUT SETTERS, Power
Bodine Corp., 317 Mt. Grove St., Bridgeport 5, Conn.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Air Tools Div., Reed Roller Bit Co., Houston, Texas
Consolidated Mch. Tool Div., Blossom Road Rochester 10, N. Y.
Cross Co., P. O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SCREW MACHINES, Hand—See Lathes, Turret, Ram-type, Saddle-type

SCREW MACHINES, Multiple-Spindle Automatic
Greenlee Bros. & Co., 2136 12th St., Rockford, Ill.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Scherr George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Warner & Swasey Co., 6701 Carnegie Ave., Cleveland 3, Ohio

SCREW MACHINES, Single-Spindle Automatic
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio

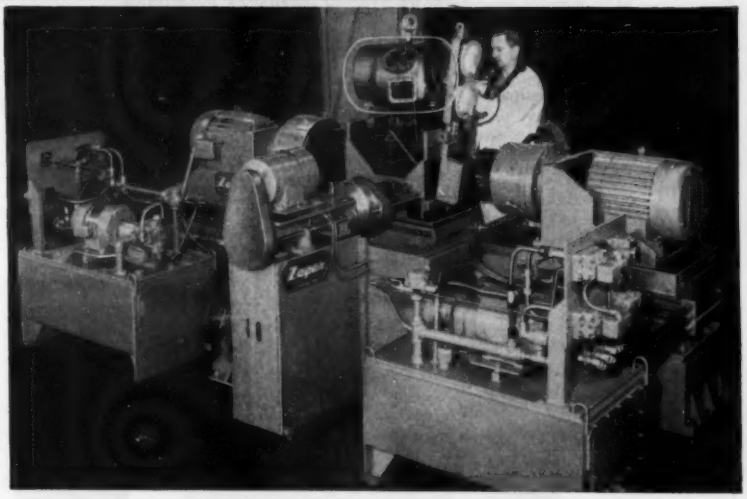
(Continued on page 308)



why gearless drill heads?

Each of four heads drills three different hole patterns. Drilling pattern is changed merely by removal and replacement of respective drills. In all, 108 holes are drilled.

because Zagar *gearless design can use more spindles and do more work*



Zagar gearless design in multiple spindle machining permits a flexibility unmatched by any other equipment. Basically, the application of more and still more spindles is the key to savings in every stage of the job. From incipient engineering through cost per part (or cost per hole), every step is marked by cost-saving over any other approach. As spindles are added, cost per spindle actually decreases. This advantage obtains whether the head is designed to produce one part or more than one part of varying machining patterns.

When drilling, reaming and tapping on more than one part, Zagar can often apply one head to do several patterns. Zagar heads drill, ream, and tap varying diameters on any center.

See Three Zagar Exhibits at the A. S. T. E. Show: Booths 351, 718, and 1653

Zagar INCORPORATED
23888 Lakeland Blvd. • Cleveland 23, Ohio

USE MORE SPINDLES TO DO MORE WORK

For more data circle this page number on card at back of book

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

SCREW PLATES

Greenfield Tap & Die Corp., Greenfield, Mass.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.

SCREWS, Cap, Set, Self-tapping, etc.—See Bolts, Nuts and Screws

SEPARATORS, Magnetic

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

SET-UP EQUIPMENT

Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 46, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SHAFTS

Thomson Industries, Inc., Manhasset, L. I. N. Y.

SHAPERS, Crank and Hydraulic

Austin Industrial Corp., White Plains, N. Y.
Cincinnati Shaper Co., P. O. Box 111, Cincinnati 11, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Nebel Machine Tool Corp., 3401 Central Pkwy., Cincinnati 25, Ohio
Orban Kurt, Co., 42 Exchange Place, Jersey City 2, N. J.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.

SHAPERS, Vertical and Slotters

Austin Industrial Corp., White Plains, N. Y.
Consolidated Mch. Tool Div., Blossom Road Rochester 10, N. Y.
Lapointe Machine Tool Co., Hudson, Mass.
Orban, Kurt Co., 42 Exchange Place, Jersey City 2, N. J.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHEARS, Alligator

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio

SHEARS, Guillotine Bar

Beatty Machine & Mfg. Co., Hammond, Ind.

SHEARS, Rotary

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.

SHEARS, Squaring

Birdsboro Corp., Birdsboro, Pa.
Cincinnati Shaper Co., P. O. Box 111, Cincinnati 11, Ohio
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Famco Machine Co., Kenosha, Wis.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.

SHEET METALS—See Strip and Sheet, Ferrous, Non-ferrous

SHIM STOCK

Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Laminated Shim Co., Inc., Glenbrook, Conn.

SLITTING MACHINES, Rotary

Bliss Co., E. W., Canton, Ohio
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.
Waterbury Farrel Foundry & Mach. Co., Waterbury, Conn.
Yoder Co., 5504 Walworth Ave., Cleveland 2, Ohio

SLOTTERS—See Shapers, Vertical and Slotters

SOCKETS—See Drill Sleeves and Extension Holders

SOLENOIDS

Allen-Bradley Co., 1331 S. 1st St., Milwaukee 4, Wis.
Barnes, John S. Corp., Rockford, Ill.
General Electric Co., Schenectady, N. Y.
Vickers Inc., Administrative & Engineering Center, Box 302 Detroit 32, Mich.

SPECIAL MACHINERY AND TOOLS

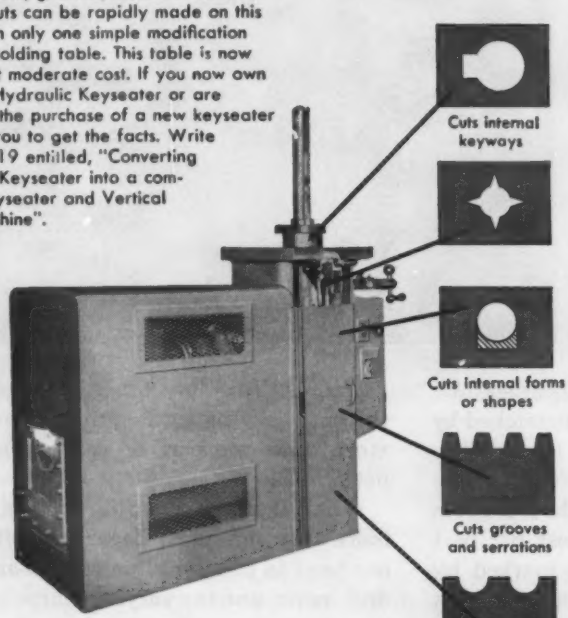
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Blanchard Mch. Co., 64 State St., Cambridge Mass.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio
Buhr Mch. Tool Co., 839 Green St., Ann Arbor Mich.
Burg Tool and Mfg. Co., Inc., 15001 S. Figueroa, Gardena, Calif.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Erie Foundry Co., Erie, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

(*Continued on page 310*)

TRIPLE THE USEFULNESS
OF YOUR **M&M**
KEYSEATER AND VERTICAL CUTTING MACHINE

Simple modification greatly increases productive capacity of this versatile machine.

An M & M Hydraulic Keyseater is not only a keyseater that cuts internal keyways up to 5" wide but a vertical cutting machine as well. Serrations, grooves, teeth—a wide variety of cuts can be rapidly made on this machine with only one simple modification — a work-holding table. This table is now available at moderate cost. If you now own an M & M Hydraulic Keyseater or are considering the purchase of a new keyseater it will pay you to get the facts. Write for Bulletin 19 entitled, "Converting the M & M Keyseater into a combination Keyseater and Vertical Cutting Machine".



M&M KEYSEATERS
AND VERTICAL CUTTING MACHINES

98

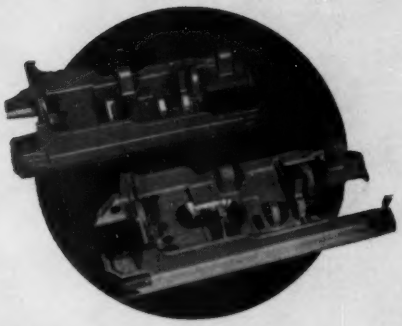
MITTS & MERRILL • 64 Holden Street • SAGINAW, MICHIGAN

Sub-contracting precision parts, assemblies and machines like these... is our business!

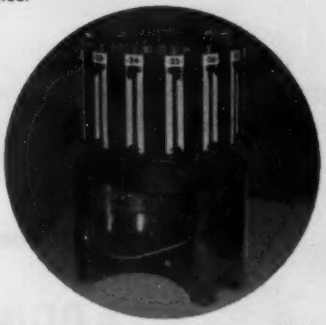
(but we want more of it)

We'd also like to prove to you what our completely integrated manufacturing facilities* can mean to you in terms of lower costs, faster delivery, and complete satisfaction.

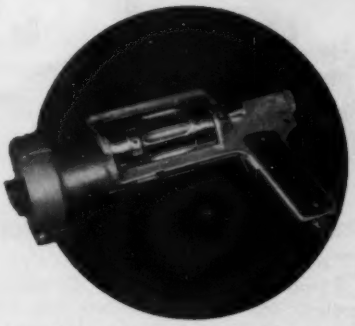
TMW's facilities and 65 years' experience in high-precision (tolerances to tenths) manufacturing are available to you *now*, on a short or long-term basis. For details or a new Facilities File Folder, call or write today.



A TMW gray iron casting before and after precise machining, annealing and finishing operations were performed.



Paint dispenser was economically mass produced for a major manufacturer in TMW's modern shops.

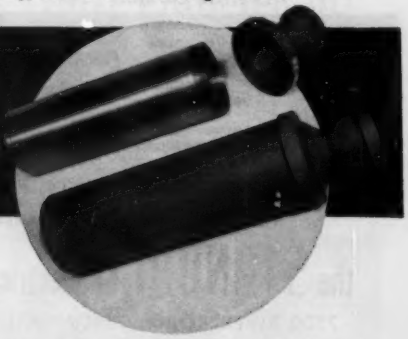


"The world's first and only automatic stud fastener" . . . (another example of TMW precision machining and assembly) carries a LIFETIME guarantee.

* Includes 1,000,000 sq. ft. of manufacturing space, 1200 *modern* machine tools, completely mechanized foundry (one of the world's largest), 3000 skilled craftsmen with a corps of top designers and engineers.

TEXTILE MACHINE WORKS

Contract Division • Reading, Pennsylvania



Jato units, used on the "Honest John" rocket to make it spin, are machined to ±.0002" tolerances and hydrostatically tested to meet strict government specifications.

For more data circle this page number on card at back of book

Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio
Ingersoll Milling Machine Co., 505 Fulton Ave., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Michigan Tool Co., 7171 E. McNicholas Rd., Detroit 12, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Motch & Merryweather Machy. Co., 888 E. 70th St., Cleveland 3, Ohio
National Acme Co., 170 E. 131st St., Cleveland, Ohio
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Twist Drill & Tool Co., Rochester, Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Root, B. M. Co., York, Pa.
Sheffield Corp., Box 893 Dayton 1, Ohio
Snyder Corp., 3400 E. Lafayette Ave., Detroit 24, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio
Sundstrand Mch. & Tool Co., 2531 11th St., Rockford, Ill.
Universal Engrg. Co., Frankenmuth 2, Mich.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.
Wicaco Machine Corp., Wayne Junction, Philadelphia, Pa.

SPEED REDUCERS
Barnes, John C. Corp., Rockford, Ill.
Boston Gear Works, 320 Main St., North Quincy 71, Mass.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland 4, Ohio
General Electric Co., Schenectady, N. Y.
Reliance Electric & Engrg. Co., 1200 Ivanhoe Rd., Cleveland 10, Ohio

SPINDLES, Machine
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
National Automatic Tool Co., S. 7th and N Sts., Richmond, Ind.
Standard Electrical Tool Co., 2488-90 River Road, Cincinnati, Ohio

SPRAYING EQUIPMENT, Metal
Metallizing Eng. Co., Westbury, L. I., N. Y.

SPROCKETS—See Gears, Cut

STAMPINGS, Sheet Metal
Laminated Shim Co., Inc., Glenbrook, Conn.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

STEEL ALLOYS—See Alloy Steels

STEEL, Cold Rolled, Stainless, High-speed, Tool, etc.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Tool Steel Co., Chicago Hts., Ill.
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Jessop Steel Co., Washington, Penna.
Ryerson, Jos. T., & Son. Inc., 16th & Rockwell Sts., Chicago 8, Ill.
Timken Roller Bearing Co., Canton, Ohio
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL DISTRIBUTORS
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Ryerson, Jas. T., & Son, 16th & Rockwell Sts., Chicago 8, Ill.

STOCKS AND DIES
DoALL Co., Des Plaines, Ill.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio
Landis Mch. Co., Waynesboro, Pa.
Threadwell Tap & Die Co., Greenfield, Mass.

STRAIGHTEDGES—See Machinists' Small Tools

STRAIGHTENERS, Flat Stock and Wire
Bliss Co., E. W., Canton, Ohio
Niagara Mch. & Tool Wks., 637-697 Northland Ave., Buffalo 11, N. Y.
U. E. Tool Co., Inc., 255 North 18th St., Ampere, E. Orange, N. J.
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.
Waterbury Farrel Foundry & Mach. Co., Waterbury, Conn.

STRIP AND SHEET, Ferrous
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, P. O. Box 2518, Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago 8, Ill.

STRIP AND SHEET, Non-ferrous
American Brass Co., 25 Broadway, New York, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Bridgeport Brass Co., Bridgeport, Conn.
Jessop Steel Co., Washington, Penna.
Ryerson Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago 8, Ill.

STRUCTURAL SHAPES
Bethlehem Steel Co., Bethlehem, Pa.
Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago 8, Ill.

STUD SETTERS—See Screwdrivers, etc.

SUPERFINISHING EQUIPMENT
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.

SURFACE PLATES
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
DoALL Co., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Pratt & Whitney Co., Inc., W. Hartford, Conn.

(*Continued on page 312*)

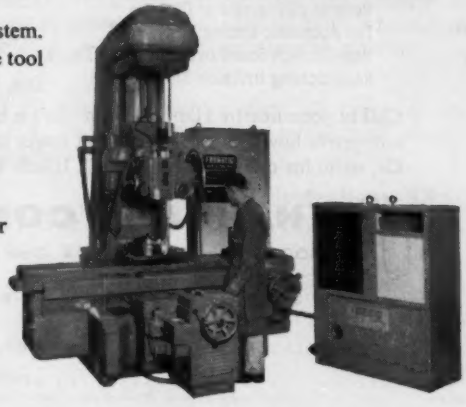
PRECISION SPINDLE DIVISION
the STANDARD electrical tool co.
2500 RIVER ROAD, CINCINNATI 4, OHIO

ASTE SHOW
Detroit
Apr. 21 to 28
Booth 1430

PRECISION BORING: Control gains a Third Dimension!

Now Fosdick adds Numerical Depth Control to its unique positioning system. Another loophole for error in precision boring has disappeared. Watch the tool drive smoothly to depth, boring a hole with finer finish, precise in depth and location. Watch the tool advance and retract quickly, saving time. *Tape or dial any depth. Absolutely no stops to preset.*

See how this control signals every tool change and compensates for tools of random length. It was planned when the Fosmatic precision boring machines were designed, so that it fits and takes no extra space. Consider what this new dimension in control means to your critical production jobs. Write for catalog PB-W.



FOSDICK THE FOSDICK MACHINE TOOL COMPANY
Cincinnati 23, Ohio

SWAGING MACHINES
Cincinnati Milling Machine Co., Meta-Dynamics Div., Cincinnati 9, Ohio (Intraform)

SWITCHES, Limit
Allen-Bradley Co., 1331 So. 1st St., Milwaukee, Wis.

TACHOMETERS—See Indicators, Speed

TAPE CONTROL SYSTEMS—See Electronic Control Systems

TAP HOLDERS
Brown & Sharpe Mfg. Co., 235 Promenade St. Providence 1, R. I.
Burgmaster Corp., 15001 S. Figeroa, Gardena, Calif.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
National Automatic Tool Co., S. 7th and N Sts., Richmond, Ind.

TAPPING HEADS
Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Davis Boring Tool Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Jarvis Corp., Stack Ave., Middletown, Conn.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Leland-Gifford Co., 1425 Southbridge St., Worcester, Mass.
National Automatic Tool Co., S. 7th & N Sts., Richmond, Ind.
Thriftmaster Products Corp., 1014 N. Plum St., Lancaster, Pa.
Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

TAPPING MACHINES
Baker Brothers Inc., 1000 Post Ave., Toledo 10, Ohio
Baush Machine Tool Co., 15 Wason Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport 5, Conn.
Buhr Machine Tool Co., 839 Greene St., Ann Arbor, Mich.
Burg Tool and Mfg. Co., Inc., 15001 S. Figueroa, Gardena, Cal.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, N. Y.
Cincinnati Bickford Div. of Giddings & Lewis Mch. Tool Co., Oakley, Cincinnati 9, Ohio
Cross Co., P. O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.
Edlund Machinery Co., Cortland, N. Y.
Elox Corp. of Michigan, Troy, Mich.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.
Landis Mch. Co., Waynesboro, Pa.
Moline Tool Co., 102 30th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Snyder Corp., 3400 E. Lafayette Ave., Detroit 24, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 2, Ohio
Zagar, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

TAPS, Hand, Machine Screw, Pipe, etc.
DoALL Co., Des Plaines, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Jarvis Corp., Stack Ave., Middletown, Conn.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Box 893, Dayton 1, Ohio
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

TAPS, Collapsing
Geometric-Horton Div., United Greenfield Corp., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mch. Co., Waynesboro, Pa.
Sheffield Corp., Box 893, Dayton 1, Ohio

TESTING EQUIPMENT Air, Oil & Water Pressure
Lamb, F. Joseph Co., 5663 E. Nine Mile Rd., Detroit 34, Mich.

THREAD CUTTING MACHINES
Davis & Thompson Co., 4460 W. 124th St., Milwaukee 10, Wis.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Box 893, Dayton 1, Ohio

THREAD CUTTING TOOLS
Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 46, Ill.
Geometric-Horton Div., United Greenfield Corp., New Haven, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Sheffield Corp., Box 893, Dayton 1, Ohio

THREAD ROLLING DIES—See Dies, Thread Rolling

THREAD ROLLING EQUIPMENT
Landis Mch. Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio
Reed Rolled Thread Die Co., Holden, Mass.
Sheffield Corp., Box 893, Dayton 1, Ohio
Waterbury Farrel Foundry & Mch. Co., Waterbury, Conn.

TOOL CONTROL BOARDS
Cross Co., P. O. Box 3835, Park Grove Postal Sta., Detroit 5, Mich.

TOOL HOLDERS
Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 46, Ill.
Burgmaster Corp., 15001 S. Figueroa, Gardena, Calif.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.

(Continued on page 314)

NOW...index tables

FOR MORE ECONOMICAL PRODUCTION ON THESE NEW

HANNIFIN

"FD" PRESSES

Heavy-duty open-gap production presses with Hannifin hydraulic index tables...

Available in all of these sizes:

2, 3, 4, 5 and 6-ton bench models
6, 8, 10, 12 and 15-ton floor models

WITH THESE FEATURES...	USE THEM FOR...
Dual Safety Hand Lever Controls	Assembly Operations
Dual Electric Push-Button Controls	Riveting—Staking
Adjustable Stroke Control	Forming—Stamping
Reverse on Pressure or Distance	Trimming Die Castings
Full Automatic Cycling	Trimming Plastics
Hannifin High Speed Hydraulic Index Tables	Molding Semi-Conductors
Reciprocating Hydraulic Slide Feeds	Preformed—Compacting

Call in your nearby Hannifin man—he's a trained production analyst—to prove how you can do more at lower cost with Hannifin presses. Or, write for our new Bulletin 132. It tells the whole story.

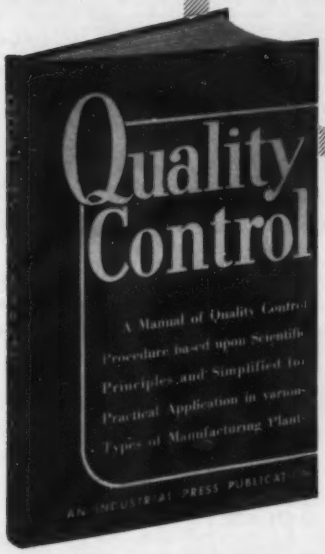
HANNIFIN COMPANY

509 South Wolf Road • Des Plaines, Illinois

A DIVISION OF PARKER-HANNIFIN CORPORATION

New
Enlarged
Fourth Edition

IMPROVE YOUR PRODUCT
REDUCE COSTS TOO!



New fourth edition—simplified for practical application—presents the latest and best techniques of statistical quality control:

- **Statistical evaluation of tolerances**
- **Process investigation (evolutionary operation to achieve optimum quality and production)**
- **Ready-made sampling plans**
- **Control charts**
- **Illustrations and step-by-step examples**
- **Tabulated data**

Quality Control is an up-to-date manual that is simpler yet more complete than any other text on this subject. It is, first and foremost, a practical working tool that contains easy-to-read data, ready to be applied in every kind of manufacturing plant. Emphasis is on clarity. Modern methods of statistical quality control are explained in simple terms and step-by-step examples. Wherever possible, computations have been replaced with ready-made tabular data. The new fourth edition explains the use of statistical evaluation of tolerances as an aid in establishing and maintaining realistic tolerance specifications. It also describes a new technique on process investigation and evaluation that will help you find the process settings that will yield optimum quality and productivity. The author, Norbert L. Enrick, is well known as a consultant for over a hundred industrial plants, and as a teacher of quality control. He has carefully selected illustrations from his work in the metalworking, electronic, chemical, food and textile industries as examples of the scientific principles and methods he sets forth.

MATERIAL COVERED IN TWENTY-ONE CHAPTERS

CONTROL CHARTS
• Charts based on maximum and minimum specifications. • Charts based on average specifications. • Special charts for old and worn equipment. • Charts for defects control. • Charts for control of machine efficiency and productivity.

SAMPLING PLANS
• Ready-made sampling tables, with plans ranging from 0.25 to 12 Per Cent Defectives and Lot Sizes up to 100,000. • Separate tables for piece parts and continuous product. • Regular and sequential procedures.

TOLERANCING
• Basic tolerance systems. • Evaluation of product tolerance against frequency patterns. • Evaluation of tolerance combinations. • Statistical tolerancing to achieve realistic specifications.

EXPERIMENTING IN THE PLANT
• Simplified uses of analysis of variance in quality investigations. • Determination of optimum processing settings through "evolutionary operation."

MANAGEMENT ASPECTS
• Principles. • Organization. • Installation. • Reports. • Case Histories.

BACKGROUND MATERIAL
• Fundamentals of inspection, gaging and testing in modern mass production. • Statistical Basis of modern quality control. • Common interchangeable terms.

INCLUDED ARE
• Over 50 illustrative examples from all types of applications. • Convenient reference tables and charts. • Many diagrams and charts.

ORDER YOUR COPIES TODAY! **216 pages, 43 illustrations. $5.50**

Mail to: THE INDUSTRIAL PRESS, 93 Worth St., New York 13, New York

Please send me ..... copies of *Quality Control* @ $5.50.
☐ Payment is enclosed. Please send postpaid
☐ Bill me ☐ Bill company
Postage and handling charges will be added to billed orders. Orders from foreign countries—except Canada—must send payment in full including 50¢ per book postage and handling charges.

Name .....
Company .....
Company Address .....
Home Address .....
(Fill in last line if you want book(s) sent to your home.) M4/60

DeVlieg Microbore Div., 2720 W. Fourteen Mile Road, Royal Oak, Mich.
DoALL Co., Des Plaines, Ill.
Kennametal, Inc., Latrobe, Penna.
Metal Carbides Corp., 6001 Southern Blvd., Youngstown 12, Ohio
Vascoloy-Ramet Corp., Waukegan, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOL MATERIAL, Cast Non-Ferrous Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 46, Ill.
Vascoloy-Ramet Corp., Waukegan, Ill.

TOOL MATERIAL, Cemented Carbide

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5213 W. Armstrong Ave. Chicago 46, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
DoALL Co., Des Plaines, Ill.
Kennametal, Inc., Latrobe, Penna.
Metal Carbides Corp., 6001 Southern Blvd., Youngstown 12, Ohio
Vascoloy-Ramet Corp., Waukegan, Ill.
Wesson Co., 1220 Wodward Heights Blvd., Detroit 20, Mich.

TOOL MATERIAL, Ceramic

Metal Carbides Corp., Youngstown 12, Ohio
Norton Co., 1 New Bond St., Worcester 6, Mass.
Vascoloy-Ramet Corp., Waukegan, Ill.

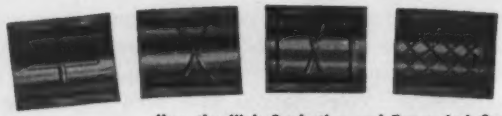
TOOL MATERIAL, High-Speed Steel

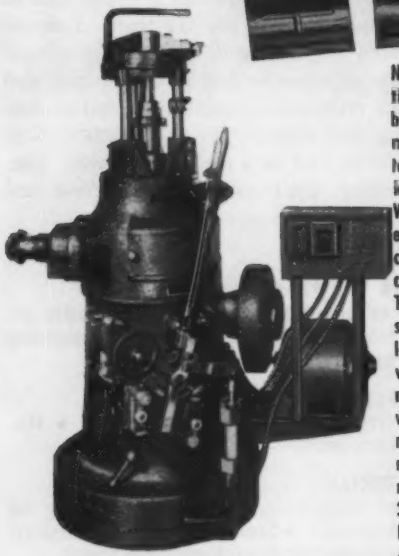
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 46, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
Crucible Steel Co. of America, P.O. Box 2518, Pittsburgh 30, Pa.
Jessop Steel Co., Washington, Penna.
Vanadium-Alloys Steel Co., Latrobe, Penna.

Super High Speed

AUTOMATIC FEED OIL GROOVING MACHINE

INCREASES PRODUCTION — CUTS COSTS





Now the High Production and Economical Operation of the WICACO CONTINUOUS OIL GROOVER can be doubled or tripled with the first and only Automatic Feed mechanism that permits the operator to run more than one machine, with every cut identical.

WICACO CONTINUOUS OIL GROOVER cuts grooves of every description, continuous or intermittent, and can be fitted with a pneumatic holding fixture synchronized with the Automatic Feed.

The operator loads and unloads the work without stopping the machine, a valuable time saver. Feed lever automatically returns to neutral position whn cutting tool reaches proper depth. The spindle, not the chuck, revolves, permitting fast and convenient grooving of a variety of larger and irregular work. The machine may be returned to manual operation very easily and quickly. Maximum depth of groove is 7/32", maximum width 3/8". Grooves may be cut in work from 1/4" I.D. to 4 1/2" O.D. Standard chuck holds work to 4 1/2" O.D. Stroke of spindle is 0" to 7". Floor space is 24" dia. and weight of machine is approximately 950 lbs.

The Automatic Feed mechanism can be supplied for attaching to older model Oil Groovers. Send us samples for grooving to specifications, time and cost estimate, without obligation. Ask for descriptive booklet.

WICACO

SINCE 1868

THE WICACO MACHINE CORPORATION

4804 STENTON AVENUE PHILADELPHIA 44, PA.

Telephone DAvenport 9-4414

TRACING ATTACHMENTS

American Tool Works Co., Pearl & Eggleston Aves., Cincinnati 2, Ohio
Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gisholt Machine Co., 1209 E. Washington Ave., Madison 10, Wis.
Gorton Mch. Co., 1321 Racine St., Racine, Wis.
Jones & Lamson Mch. Co., 512 Clinton St., Springfield, Vt.
Pratt & Whitney Co., Inc., W. Hartford, Conn.
Wales-Strippit, Inc., Akron, N. Y.
Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio

TRANSFER MACHINES

See Multiple-Station Machines

TRANSFORMERS, Welding

Precision Welder & Flexopress Corp., 3518 Ibsen Ave., Cincinnati 9, O.

TRANSMISSION, Variable Speed

Barnes, John S. Corp., Rockford, Ill.
Boston Gear Wks., Quincy, Mass.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland 4, Ohio
Denison Engineering Div. American Brake Shoe Co., 1152 Dublin Rd., Columbus, Ohio
Vickers Inc., Administrative & Engineering Center, Box 302, Detroit 32, Mich.

TRUCKS, Material Handling

Hamilton Tool Co., 834 So. 9th St., Hamilton, Ohio

TUBE-FLANGING MACHINES

Niagara Mch. & Tool Wks., 637-697 Northland Ave., Buffalo 11, N. Y.

TUBE FORMING AND WELDING MACHINES

Yoder Co., 5504 Walworth Ave., Cleveland, Ohio

TUBE MILLS

Yoder Co., 5504 Walworth Ave., Cleveland, Ohio

TUBING, Non-ferrous

American Brass Co., 25 Broadway, New York, N. Y.
Crucible Steel Co., of America, P. O. Box 2518, Pittsburgh 30, Pa. (Titanium, Zirconium)
Mueller Brass Co., Port Huron 34, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago 18, Ill.

TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Babcock & Wilcox Co., Beaver Falls, Pa.
Crucible Steel Co., of America, P. O. Box 2518, Pittsburgh 30, Pa. (Stainless & High Alloy)
National Tube Div., U. S. Steel Corp., 525 Wm. Penn Place, Pittsburgh, Pa.
Revere Copper & Brass Inc., 230 Park Ave., New York 17, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio

TUBE & PIPE CUTTING-OFF MACHINES

Grieder Industries, Inc., Bowling Green, Ohio
Sheffield Corp., Box 893, Dayton 1, Ohio

ULTRASONIC MCH. TOOLS

Sheffield Corp., Box 893, Dayton 1, Ohio

VALVE CONTROLS

Barnes, John S. Corp., Rockford, Ill.
Logansport Mch. Co., Inc., Logansport, Ind.
Moog Servocontrols Inc. E. Aurora, N.Y.
Vickers Inc., Administrative & Engineering Center, Box 302, Detroit 32, Mich.

VALVES, Air

Hannifin Co., Div. Parker-Hannifin Corp., Des Plaines, Ill.
Hydraulic Press Mfg. Div., Mt. Gilead, Ohio
Logansport Mch. Co., Inc., Logansport, Ind.
Ross Operating Valve Co., 110 E. Golden Gate Ave., Detroit 3, Mich.
Schrader's Son, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.
Skinner Electric Valve Div., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.

VALVES, Hydraulic

Barnes, John S. Corp., Rockford, Ill.
Denison Engineering Div. American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio

(Continued on page 318)

LITTLE GIANT COOLANT UNITS

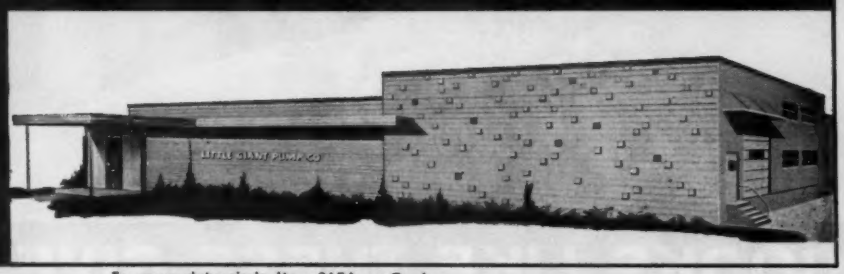
Little Giant offers the ideal coolant unit for almost any machine tool operation . . . the reason is the Little Giant recirculating pump that operates when it is completely submerged in the coolant, either water soluble or oil base. Pump is totally enclosed within coolant tank, safe from damaging elements . . . recirculates coolant onto cutting tool, minimizing waste. Units manufactured in 5 gallon and 10 gallon tank capacity models. Like all Little Giant pumps, recirculating pump in coolant unit offers years of economical, trouble-free operation.

DESIGNED ESPECIALLY FOR MACHINE TOOL OPERATION

Little Giant Pump Company builds pumps for a variety of uses. Write for your catalog today.

Little Giant PUMP CO.
P. O. Box 7025
Oklahoma City, Okla.

New Home of Little Giant Pump Co.—Triple Production Capacity to Meet Increasing Demand



For more data circle Item 315A on Card

Gears That Fit . . .
YOUR SPECIFICATIONS AND BUDGET!

These sturdy specimens of Stahl's painstaking precision were made for Reeler Drive use in steel mills. The steel spur gear is of H-arm type, 49 T., 1¼ D.P., 20° Stub. The pinion—25 T., 1¼ D.P., 20° Stub. For gears of all types and quantities, for any purpose, produced promptly at moderate cost, it will pay you to get that next estimate from Stahl.

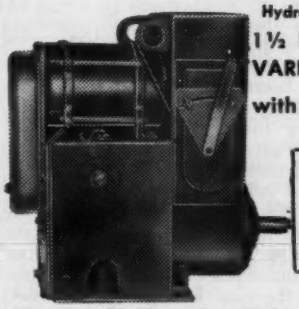
SPURS TO 72" PD. 1 DP
BEVELS TO 54" PD. 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD. 2 DP
CONTINUOUS TOOTH HERRINGBONE TO 60" PD. 2 DP
SPROCKETS TO 72" PD. 2½ DP
RACKS TO 20 FT. LONG. 3 DP
SILENT GEARS: RAWHIDE, BAKELITE, FIBROIL
HEAT-TREATED CASE OR FLAME HARDENED GEARS—OF CARBON OR ALLOY STEEL

Stahl
GEAR & MACHINE COMPANY
3901 HAMILTON AVENUE
CLEVELAND 14, OHIO

For more data circle Item 315B on Card

SAVE! Brand New Surplus

Gov't Cost $3750.00



Hydraulic
1½ H.P. TRANSMISSION
VARIABLE SPEED 0 to 350 RPM
with Instantaneous Reversing

Only $147.50 f.o.b.
COMPLETE with MOTOR
220 Volt, 60 Cy., 3 Ph., A.C.

Now own this Heavy Duty Machine at a fraction of its true value!
SATISFACTION GUARANTEED or MONEY BACK!

Incorporates A Powerful 6-to-1 Torque Multiplier For High Torque Applications Such As:

- Conveyors
- Machine Tool Drives
- Paper Machines
- Dairy Machines
- Elevators
- Winches
- Pumps
- Spring Coilers
- Sawmill Machinery
- Construction Machinery
- Textile Machinery

1½ horsepower capacity (continuous duty). Complete with totally enclosed motor, 220 volt, 60 cy., 3 ph., A.C. Output speed reversible in either direction from 0 to 350 RPM. Forward and reverse speeds can be the same or different. Speed is smooth and constant. Ideal for continuous reversing! Precise effortless speed selection. Neutral oil position. Controls easily altered for remote control. Ball and Roller bearing throughout. Manufactured to rigid Gov't specifications. Extremely compact and self-contained; size 21½" long, 9" wide, 20½" high; 200 lbs. Output shaft 1" dia., 2½" long with standard keyway. Shipped complete with full instructions and service manual.

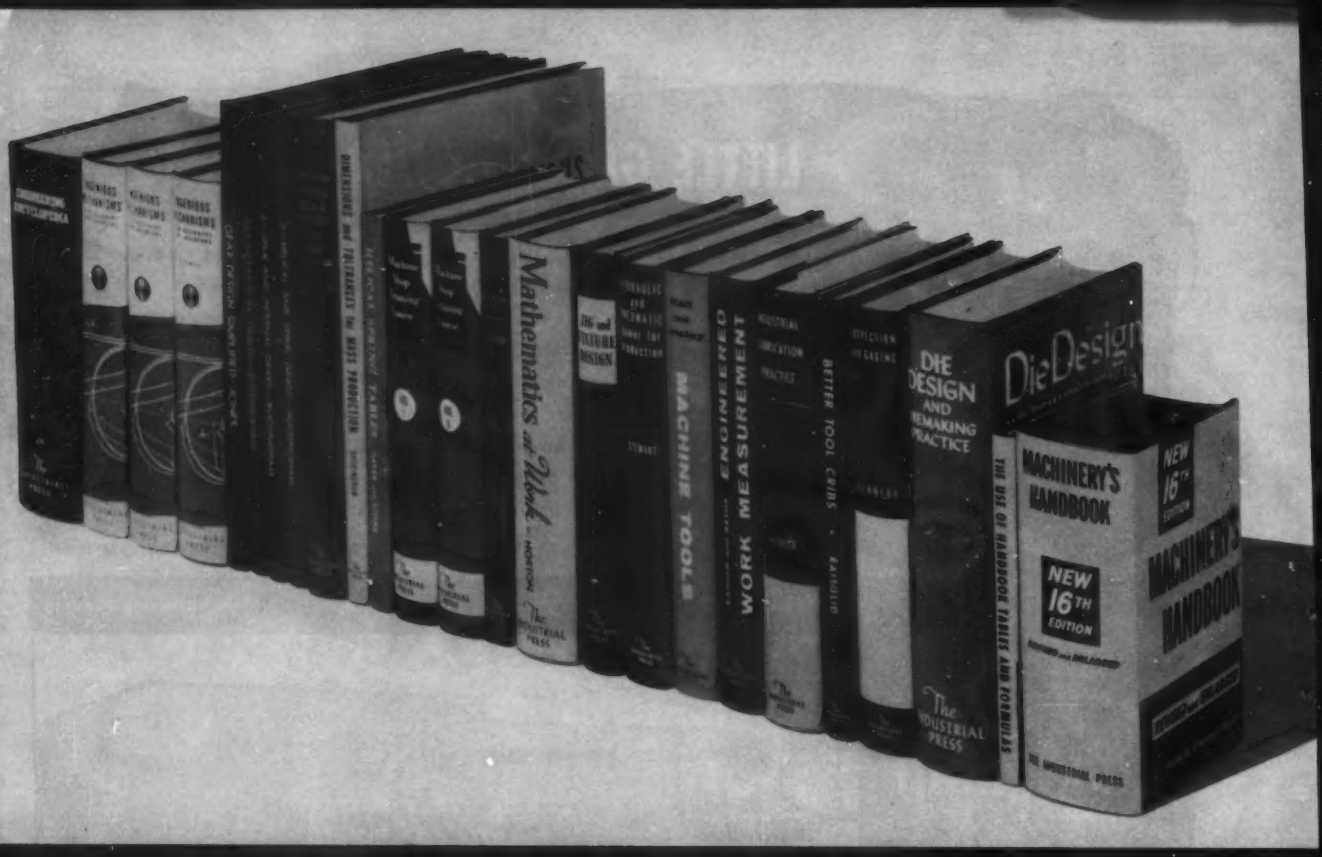
Other motors optional at additional cost. 220/440 V., 60 Cy., 3 Ph. .....add $37.50
200 V., 60 Cy., Single Ph. .....add $36.75

SUPPLY LIMITED! ORDER DIRECT FROM THIS AD

Write, wire or phone TAYLOR 9-1365

ROBERTS ELECTRIC COMPANY, Dept. M-29
849 W. GRAND AVE. CHICAGO 22, ILL.

For more data circle Item 315C on Card



BOOKS LIKE THESE GIVE YOU THE

MACHINERY'S HANDBOOK—16th EDITION
2104 pages. $11.00

Wherever metal products are designed and built, wherever metalworking operations are performed, MACHINERY'S HANDBOOK is the indispensable working reference. For more than 45 years it has been read and referred to on the job in thousands of drafting rooms, machine shops and manufacturing plants—saving time, work and money for its users. And now, in this greatly revised and enlarged edition, you get all the latest and best principles, practices, specifications, standards and other useful working data. The 16th Edition reflects the tremendous advances the metalworking industries have made; and it gives you the information you need to keep pace with that progress. Here are just a few of the hundreds of subjects that have been brought up-to-date in the new enlarged and revised 16th Edition: Screw Thread Systems; Rivets and Riveted Joints; Reamers; Taps and Threading Dies; Tap Drills; Knurling and Knurling Tools; Strength of Materials; Plain Bearings; Ball, Roller and Needle Bearings; Gearing; Springs; Involute Splines and Serrations; Keys and Keyways; Twist Drills; Standards; Physical Properties of Steels; Self-Tapping Screws; Tapers; Screw Thread Inserts; Strength of Threaded Connections; Conversion Tables; Wire and Sheet Metal Gages; Wire Rope; Involute Functions; Bolts, Screws, Nuts, Washers; Mechanics; Flat Belts; Transmission Chains; Metal Joining, Cutting and Surfacing; Flywheels; Shafts; Carbide Boring Tools; Velocity and Acceleration and much, much more.

THE USE OF HANDBOOK TABLES AND FORMULAS
$2.00. When sold with HANDBOOK, $1.50.

Essential timesaving tables, rules and general information that the ordinary use of MACHINERY'S HANDBOOK may never discover are spotlighted. Examples, solutions and test questions show typical applications of HANDBOOK matter in both drafting-rooms and machine shops. Enables the HANDBOOK user to obtain the required information quickly.

INGENIOUS MECHANISMS FOR DESIGNERS AND INVENTORS
Three Volumes
Single Volume, $6.50. Complete Set, $16.00.

Unparalleled in scope and usefulness, INGENIOUS MECHANISMS is an encyclopedia of mechanical movements. Each one of the three volumes is an independent treatise on the subject of mechanisms—similar in size and general character, but entirely different in content matter. The mechanisms are grouped into chapters according to general types. This arrangement by function plus a complete index, makes it easy to find the class of movement desired, and enables you to compare mechanisms which are similar in purpose but different in design. Tells plainly and briefly *what* each mechanism consists of, *how* it operates and the *features* which make it of special interest. Every one of the hundreds of mechanisms described in these volumes embodies an idea or principle which you may be able to use in designing machines or other mechanical devices. Ingenious mechanisms will give you job tested answers to many of your difficult mechanical design problems.

THE NEW PRODUCT
234 pages. $5.00

A guide for successful product development, it discusses the complexities involved and provides tangible help to both experienced manufacturers and those who have done little or no product development. The subject is discussed from the viewpoint of general management. Basic concepts of top management planning and organization for product planning and new product development are covered. Each major functional area of the business enterprise regarding the successful development and marketing of new products is analyzed, and helpful check lists are provided. The book contains chapters on: Basic concepts, organization, finding new product ideas, costing and pricing, patents, research and engineering, sales, advertising and management considerations of new product development.

AUTOMATIC CONTROL: PRINCIPLES & PRACTICE
Published by Reinhold Publishing Corporation
282 pages, $7.50

This much-needed guide offers the practical results of scientific research on control systems in non-mathematical terms. It provides the layman and technician alike with sound coverage of principles and applications. The book begins with the dynamic behavior of control systems, including static requirements and adjustment for peak performance. Next, it covers mechanical and electrical components—measuring elements, controllers, and the specific part played by control valves. The final section describes the various control systems and their specific applications.

MANUAL OF GEAR DESIGN
Three Volumes. Any single volume, $5.00
Complete set, $12.50

A working manual which contains information required for solving the majority of gear problems. Section I consists of mathematical tables required for the solution of gear problems. Section II contains simple formulas and time-saving tables required to solve all kinds of spur and internal gear designing problems. Section III contains formulas, charts and tables used in designing helical gears for parallel shaft drives and "spiral" gears for non-parallel, non-intersecting shafts. Formulas and diagrams are accomplished by worked-out, practical examples, to show solutions as well as how each formula is actually applied in gear designing practice.

QUALITY CONTROL—4th ENLARGED EDITION
216 pages, 43 illustrations. $5.50

Improve average quality of products and save money with plant-tested scientific principles. Examples show statistical quality control under different manufacturing conditions. Includes typical case history. Discusses control charts, analysis of variance and interchangeable terms. Explains use of statistics for establishing tolerances. Tells how statistical techniques may be applied to obtain a step-by-step improvement in long-run production operations. Simple, complete, practical.

FASTENERS HANDBOOK
Published by Reinhold Publishing Corporation
433 pages, 900 illustrations. $12.50

Standard and proprietary fasteners from all manufacturers. Data, illustrations, descriptions. Gives usage and money-saving applications. Locates suppliers of fasteners described.

HANDBOOK OF BARREL FINISHING
Published by Reinhold Publishing Corporation
288 pages. $8.25

Barrel finishing covered step-by-step. Specification sheets give necessary information for finishing large variety of parts. Equipment, compounds, methods are described.

ANSWERS WHEN YOU NEED THEM!

ENGINEERING ENCYCLOPEDIA
1431 pages, 206 drawings. $10.00

For everyone engaged in any kind of mechanical work who can use essential facts about thousands of standard and special engineering subjects. This one-volume work consists of clearly written concise treatises, definitions of numerous terms used in engineering and manufacturing practice, and the results of many costly and important tests and experiments.

INSTRUMENTS FOR MEASUREMENT AND CONTROL
Published by Reinhold Publishing Corporation
377 pages. $10.00

Describes, illustrates and compares all the most recent devices for measuring and controlling temperature, moisture, pressure, flow, uniformity, etc. In non-mathematical language, the book discusses the design, construction and operation of instruments, shows how various instruments compare with each other, and points out the factors to consider in choosing the proper instrument for a particular job.

BETTER TOOL CRIBS
152 pages, 87 illustrations. $4.00

Tells and shows by specific, detailed examples how to organize and operate an efficient tool crib; how to avoid wasteful, haphazard methods of tool crib operation. Several complete control systems based on the use of brass tool checks and triplicate tool charge slips are clearly described. The layout of a complete tool crib is described in step-by-step fashion to show how you can achieve maximum benefits from the proper location of various pieces of storage equipment and the tools and materials stored therein.

14,000 GEAR RATIOS
400 pages. $8.00

Tabulated gear ratios for 2- and 4-gear combinations. Common fractional ratios & decimal equivalents; decimal ratios, logs & equivalent pairs of gears; total number of teeth with equivalent gear pairs & ratios; number & equivalent gear factors.

The Industrial Press, 93 Worth St., New York 13, N. Y.

Please send me the books listed below, under the terms checked at the right.

.....

.....

.....

Name .....

Company .....

Street & No. .....

City ..... **Zone** ..... **State** .....

M4/60

CHOOSE YOUR MOST CONVENIENT METHOD OF PAYMENT

☐ I enclose check or money order covering payment in full. Send books postpaid. (Orders from foreign countries, except Canada, must be accompanied by payment in full including 50¢ per book postage and handling charges.)

☐ Send books under Five-Day Free Inspection Plan. If I decide to keep books I will send payment, plus postage charges, within five days.

☐ Bill me ☐ Bill company

☐ Send details of your Time Payment Plan covering the books indicated.

Hydraulic Press Mfg. Div., Mount Gilead, Ohio
Logansport Machine, Inc., 810 Center Ave., Logansport, Ind.
Vickers Inc., Administrative & Engineering Center, Box 302, Detroit 32, Mich.

VERNIERS—See Calipers, Vernier; Gages, Vernier

VISES, Machine

Austin Industrial Corp., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Milling Mch. Div., Marburg Ave., Cincinnati 9, Ohio
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Modern Mch. Tool Co., 2005 Losey Ave., Jackson, Mich.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.

WAY COVERS

Futurmill, Inc., Pontiac, Mich.

WELDING EQUIPMENT, Arc

Air Reduction Sales Co., 150 E. 42nd St., New York 17, N. Y.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio
Linde Co., 30 E. 42nd St., New York 17, N. Y.

WELDING EQUIPMENT, Gas

Air Reduction Sales Co., 150 E. 42nd St., New York 17, N. Y.
Linde Co., 30 E. 42nd St., New York 17, N. Y.

WELDING EQUIPMENT, Resistance

Eisler Engrg. Co., Inc., 750 South 13th St., Newark, N. J.
Federal Machine and Welder Co., Warren, Ohio
Precision Welder & Flexopress Corp., 3518 Ibsen Ave., Cincinnati 9, Ohio

WELDING POSITIONERS

Eisler Engrg. Co., Inc., 750 South 13th St. Newark, N. J.

WELDMENTS

Bliss, E. W., Co., Canton, Ohio
Verson Allsteel Pfess Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

WIRE

Allegheny Ludlum Steel Corp., Pittsburgh, Pa (Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, P. O. Box 2518 Pittsburgh 30, Pa. (Stainless Titanium)
U. S. Steel Corp., 525 Wm. Penn Pl., Pittsburgh 30, Pa.

WIRE FORMING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Eisler Engrg. Co., Inc., 750 South 13th St., Newark, N. J.
U. S. Tool Co., Inc., 255 North 18th St. Ampere, E. Orange, N. J.

WOODWORKING MACHINES

Clausing Div., Atlas Press Co., Kalamazoo, Mich.
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Greaves Mch. Tool Div., 2011 Eastern Ave., Cincinnati 2, Ohio
Greenlee Bros. & Co., 2136—12th St., Rockford, Ill.

WRENCHES, Allen, End, Socket, Adjustable, etc.

Allen Mfg. Co., Bloomfield, Conn.
Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 46, Ill.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York 17, N. Y.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

ZINC

New Jersey Zinc Co., 160 Front St., New York 38, N. Y.

FILMS AVAILABLE

Air Gaging

The fundamental principles of measuring dimensions with air pressure and how they are used is described in a 16-millimeter sound and color film produced by Federal Products Corporation, Providence, R. I. Entitled "Dimensional Gaging with Air," the film shows actual tests and demonstrations that illustrate the practical applications of air gaging and how air gages are used for high-production multiple inspection, and machine control. The film, which is for the experienced engineer as well as for those in training, is available on a free loan basis through the Sales Promotion & Advertising Department, Federal Products Corporation, 1144 Eddy St., Providence 1, R. I.

Abrasive Industry

"Old As The Hills" is the title of a 16-millimeter sound and color motion picture telling the story of abrasion and the growth of the abrasive industry. Released by the Norton Co. as part of its 75th anniversary celebration, the film is designed for non-technical audiences, but will be of particular interest to those who already have a good knowledge of abrasives. Free bookings of this film can be arranged by writing to the Norton Co., Worcester 6, Mass.

COLUMBIA TOOL STEELS

Confidentially, people who *make money* with non-deforming steel dies use EXL-DIE (Type 01) oil hardening steel

Product of Skilled American Workmen

COLUMBIA TOOL STEEL COMPANY
430 Lincoln Highway
Chicago Heights, Illinois

TOOL COLUMBIA STEELS

New Imperial Precision ROTARY AND INCLINABLE TABLES

7 sizes 10" to 40" diameter

A High-Precision Table at a truly modest price.

- For jig boring, assembly and inspection operations.
- 7 different sizes in 10" to 40" diameter.
- Reading in 1 or 2 seconds of arc.
- Indexing accuracy by circumferencial correction cam in 10 seconds.
- Certificate of proof furnished free.

OPTO-METRIC TOOLS, INC.
137 M VARICK STREET • NEW YORK 13, N.Y.

For more data circle Item 318A on Card

ROWE COMBINATION UNITS

working together *to give you*

a smoother, faster, more efficient manufacturing operation

Pictured is the Rowe Model A10-C2000 cradle-straightening machine. This combination gives you a dual unit that performs two operations from a single power source. This power is equal to or exceeds the total power of the units used individually.

From the model A10-C2000 you obtain the rugged performance of the 2000 series "Easy Load" coil cradle in perfect combination with the precision action of the "A" series straightening machine. Both machines are carefully engineered in every detail for ease of operation and durability. Their combination is a "natural" for added speed and efficiency in your manufacturing operations.

Rowe equipment is in use in all major metal working plants in the nation. This equipment includes Coil Cradles to 20,000 pound capacity, Straightening Machines, Straightening and Feeding Machines, Cabinet Feeds, Roll Feeds, Coil Catchers and Storage Ramps, Combination Cradle and Straightening Machine Units, Coil Buggies, Reels, Conveyors, Stackers and Complete Sheeting Lines. Write today for information concerning Rowe equipment that can help *you* save on production costs.

MODEL	MAXIMUM WEIGHT	MAXIMUM WIDTH	MAXIMUM O.D.	MAXIMUM THICKNESS
A10	2000	10"	40"	.105"
A15	2000	15"	40"	.080"
A20	2000	20"	40"	.065"
A24	2000	24"	40"	.050"

Larger and heavier capacities available.

ROWE MACHINERY AND MANUFACTURING CO. INC.
811 REGAL ROW DALLAS, TEXAS

For more data circle item 319A on Card

DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2303R North 11th St. • St. Louis 6, Mo.

CUT SCRAPER TIME

END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO., 2303R NORTH 11TH ST., ST. LOUIS 6, MO.

For more data circle item 319B on Card

JIG AND FIXTURE DESIGN

A practical book with 382 pages of information on the design and construction of jigs and fixtures for drilling, boring, planing and milling. $5 per copy. Sent on approval.

MACHINERY, 93 Worth St., New York 13, N. Y.

GEARS

Designed and Manufactured to meet

YOUR

Production Requirements

•

Custom Gears Exclusively

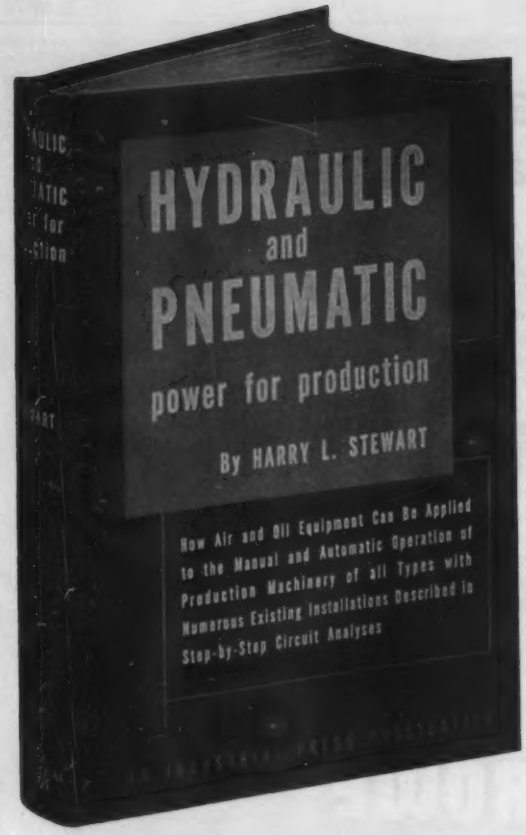
•

DIEFENDORF

GEAR CORPORATION

SYRACUSE 1, N. Y.

For more data circle item 319C on Card


HYDRAULIC
and
PNEUMATIC
power for production
By HARRY L. STEWART
How Air and Oil Equipment Can Be Applied to the Manual and Automatic Operation of Production Machinery of all Types with Numerous Existing Installations Described in Step-by-Step Circuit Analyses

Expert Help for

- Designers
- Buyers
- Installers
- Operators

of Hydraulic and Pneumatic Equipment for Production Machinery

Are you making maximum use of automatic machine and work-handling operations controlled by hydraulic or pneumatic power? HYDRAULIC AND PNEUMATIC POWER FOR PRODUCTION now provides you with comprehensive, up-to-date information on this subject, which is growing daily in importance as automation becomes more and more widespread.

HYDRAULIC AND PNEUMATIC POWER FOR PRODUCTION shows you:

...how to make the most of the advantages of fluid power.

...how to choose the equipment, the circuit arrangements and the operating medium best suited for each application.

...how to select the right kind of packings and seals for hydraulic and pneumatic applications.

...how to decide on the kind of sequencing to use.

...how to analyze equipment for accuracy of control, safety, ease of operation, etc.

...how to decide whether to use air or oil to do a particular job.

...how to maintain your hydraulic and pneumatic equipment at top operating efficiency.

With the tremendous variety of equipment that is available, and the almost infinite number of circuit arrangements that are possible, it requires expert knowledge to make the most efficient use of hydraulic and pneumatic power—knowledge that takes years of study and experience to acquire. HYDRAULIC AND PNEUMATIC POWER FOR PRODUCTION has been written by an expert who has spent many years in the fluid-power field. The author, Mr. Harry L. Stewart, is well equipped to answer the questions that arise when the application of fluid power is under consideration, and to supply the facts that you should know if you are to get the most out of your equipment after it is placed in operation.

From a wealth of firsthand experience, and with the cooperation of experts and manufacturers of all types of hydraulic and pneumatic equipment, he has brought together information not hitherto available in a single, convenient source . . . information that will be invaluable to the newcomer to the field and that will also serve as a useful reference to those now active in fluid-power work. A review of the chapter headings at the left will give you some idea of the scope of the book.

If you are planning to purchase, install or operate hydraulic or pneumatic equipment, this book can save you many hours of time and more than repay its cost. Here is a veritable encyclopedia of information about fluid-power circuits, types of equipment and operational details. Order your copy today and put it to work for you at once. Just use the convenient coupon below, and note that you may return the book within five days if you do not find it completely satisfactory.

COVERS ALL THESE SUBJECTS!

The Evolution of Fluid Power
Hydraulic Fluids
The Hydraulic Power Unit
Hydraulic Accumulators
Fluid Power Lines
Hydraulic Valves and Their Functions
Hydraulic Cylinders, Intensifiers, and Motors
Heat Exchangers for Hydraulic Systems
Synchronizing the Movement of Fluid Power Rams
Dual Pressure Hydraulic Systems
Safety Controls for Hydraulic Circuits
Sequencing of Hydraulic Cylinder Motion
Packings and Seals
Air Filters, Lubricators and Regulators
Pneumatic Controls
Air Cylinders and Their Design
Power-operated Holding Devices
Pneumatic Safety Circuits
Remote Control Pneumatic Systems
Combination of Fluids in a Single System

416 Pages
348 Illustrations

$8.50

MAIL THIS ORDER FORM TODAY

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

Please send me . . . copies of HYDRAULIC AND PNEUMATIC POWER FOR PRODUCTION (Price, $8.50). If I do not find it completely satisfactory I will return it within five days and payment will be refunded.

☐ I enclose payment in full. Send book(s) postpaid.

☐ Bill me. ☐ Bill my company. (Postage and handling charges are added if payment in full is not enclosed. Orders from overseas must be accompanied by remittance in full in U. S. funds including 50¢ additional for postage and handling.)

NAME ..... POSITION* .....

COMPANY .....

CITY ..... ZONE ..... STATE .....

HOME ADDRESS .....

(Please fill in if you want book sent to your home)

N-4/60

* This information would be appreciated for our records.

See Future Machining Come To Life...

a complete
"IN OPERATION"
demonstration of
FUTURMILL PRODUCTS

- milling cutters
- planer conversion
- new machine tool way covers
- tool and load control instruments

PRODUCTION PLUS
at the
TOOL SHOW
April 21 - 28
Detroit, Michigan
BOOTH 1042
COST MINUS

For more data circle item 321A on Card

SECOND EDITION

DIE-CASTING

By Charles O. Herb

DIE-CASTING, by Charles O. Herb, Editor of MACHINERY, covers die-casting from its earliest phases up to today's advanced practices. It is a valuable reference work for everyone engaged in the design, production or use of die-castings.

The latest models of automatic and manually operated die-casting machines are illustrated and described, including fully hydraulic machines of the vertical and horizontal cold-chamber types, air-operated vertical machines, machines convertible from cold-chamber to gooseneck type operation, etc. Tables of die-casting alloy compositions include the latest developments, and are supplemented by text discussion of their properties and applications. 310 pages, 196 illustrations. $5.00. Send your order to:

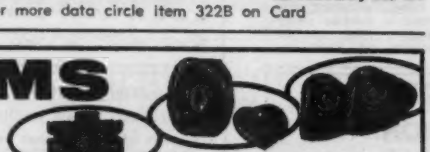
THE INDUSTRIAL PRESS, 93 Worth St., N. Y. 13

GEARS—**ALL MAKES . . . Special and standard**
PRECISION GEARS UP TO 200 DIAMETRAL PITCH
All Gears certified for Accuracy
Quality and Fine Workmanship
NEW JERSEY GEAR & MFG. CO.
1470 Chestnut Ave. **Hillside, N. J.**

For more data circle Item 322B on Card

CAMS

ALL TYPES MADE TO YOUR SPECS!



Mfrs' agents wanted

Dr. Chas. Eisler ME, Founder
Chas. Eisler, Jr., Pres.

EISLER ENGINEERING CO., INC. | 236 SOUTH 13TH STREET NEWARK 3, N. J. U.S.A.

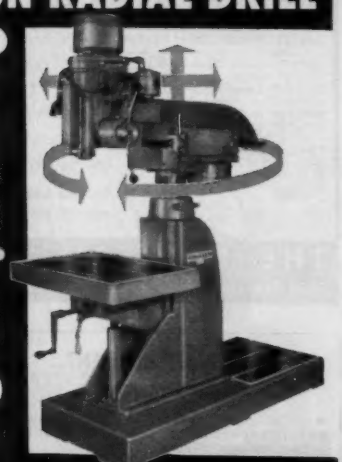
For more data circle Item 322C on Card

MANY HOLES FROM 1 SET-UP
With A
JOHANSSON RADIAL DRILL

Move the drill, not the work. Slides, elevates and rotates for quick and easy hole location.

8-speed gear drive. Proper speeds instantly—change while machine is running.

Large or small work pieces handled with ease—drill head swings 360° allowing work to be placed on front table or rear platform.



Drilling capacity . . . . . 1¾"
Spindle taper . . . . . Morse No. 4
Spindle speeds (8) . . Various Ranges
Spindle to col. (max.) . . . . . 36"
Spindle to work surf. (max.) . . . 53"

Write for new catalog today.

I. O. Johansson Company, 7242 N. St. Louis, Skokie, Ill.

For more data circle Item 322D on Card

Classified and Resale Section

CLASSIFIED ADVERTISING RATES: $12 per single column inch

eastern Rebuilt Machine Tools

THE SIGN OF QUALITY

THE MARK OF DEPENDABILITY

The listing below is only a VERY SMALL AMOUNT of the total number of machine tools that we have in stock for immediate shipment. Our prices are realistic with today's market and our quality of rebuilding is the same high standard—THE LEADER IN THE FIELD OF REBUILT MACHINE TOOLS.

INTERNAL GRINDERS
Type IG 103 Gremby, m.d.
No. 5 Bryant, m.d., latest
No. 5Y Bryant, m.d., latest
No. 16-16" Bryant, m.d., hydraulic hole grinder
No. 16CR16" Bryant, m.d., latest
No. 16-22" Bryant, m.d., latest
No. 16-38" Bryant, m.d., latest
No. 16-A-28" Bryant, m.d.
No. 24-36" Bryant Hole & Face Type, m.d., late
No. 24-P-26" Bryant, m.d.
No. 24-21" Bryant, m.d.
No. 24-L-36" Bryant, m.d., late
No. 24-LW-36 Bryant, m.d., late
No. 649-16" Van Norman Automatic Oscillating Radius, m.d., latest
No. 70A Heald, m.d., latest, 1945
No. 72A3 Heald Full Universal, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A3 Heald Plain, m.d.
No. 72A3 Heald Plain Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 73 Heald Airplane, m.d., latest, new
No. 74 Heald Long Base, 1945
No. 74 Heald Extended Bridge Type, m.d.
No. 74 Heald, Plain Long Base, m.d., 1943
No. 74 Heald, m.d.
No. 75A Heald, m.d., latest
No. 78 Heald Centerless Cylinder, m.d.
No. 81 Heald Gagematic, Sizematic, m.d.
No. 81 Heald Plain & Sizematic, m.d.
No. 104 Rivett, m.d.
No. 172 Heald Plain Adjustable Gap Hydraulic, m.d.
No. 112YE Bryant, m.d.

PLAIN CYLINDRICAL GRINDERS
No. 5 Brown & Sharpe, Plain, m.d., 1942
No. 20—10x18" cap. Brown & Sharpe Plain, m.d.
6x15" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Landis Type C Hydraulic, m.d., late
6x18" Norton Plain Grinder, m.d.
10x18" Cincinnati Plain Hydraulic, Model ER, m.d., Filmatic Spindle, 1943
10x18" Cincinnati Model EA, m.d.
10x18" Norton Type C, m.d., latest
10x18" Cincinnati Model ER Plain, m.d.
10x36" Cincinnati Hydraulic, Model EA, m.d.
10x36" Norton Type C, m.d.
10x36" Landis Type CH Plain, m.d.
10x48" Cincinnati Model ER Plain Hydraulic, m.d.
12x36" Landis Plain Self-Contained, m.d.
14x36" Landis Type C, m.d., 1945
16x96" Cincinnati Plain, m.d.
16x120" Landis Type B Plain H.D. Hydraulic, m.d., late
18x36" Landis Type C, m.d.
18x72" Norton Type C, mechanical, m.d.
20"x72" Landis Type DC, m.d., 1944
23"x36" ce Norton Type C, m.d.
23"x72" ce Type C Norton Semi-Auto., Hydraulic
23"x72" Landis Type C, m.d.

SNAG GRINDERS
7½ H.P. United States Elec. Tool Co. Double End. Model 80, new
Type No. 50—7½ H.P. Standard Elec. Tool Co. Double End, m.d.
25 H.P. U.S. Elec. Co., Heavy Duty Double End, m.d.

THREAD GRINDERS
No. 33 Excello Precision, m.d.

TOOL & CUTTER GRINDERS
Cincinnati Monoset
No. 91A Covel Universal, m.d.
Pratt & Whitney Deep Hole Drill Sharpener, m.d.
No. 1 Heald Tool Sharpener, m.d.
No. 2A Wm. Sellers Universal Tool Grinder, m.d.
No. 2B Sellers Wet Drill Grinder, m.d.
No. 4T Sellers Tool, m.d., latest
No. 6G Sellers, m.d.
12" Gleason Spiral Bevel, Gear Cutter Sharpener, m.d.
No. 13 Gleason Cutter Sharpener, m.d., late
No. 13 Brown & Sharpe Universal, m.d.
No. 4-4 Barber-Colman Hob Sharpener, m.d.
Sundstrand Tool Grinder, m.d.
12x28" Landis Universal & Tool Grinder, m.d.
No. 2 Cincinnati Plain, m.d., 1945

UNIVERSAL GRINDERS
10x24" Landis Type C Hydraulic Universal, m.d.
12"x36" Cincinnati, m.d.
14x36" Norton, m.d.
14"x48" Landis Type C, m.d.
14x72" Norton Universal Hydraulic, m.d.
18x66" Landis Universal Type C, m.d.

HONE MACHINES
No. 6 Barnes Twin Spindle Horizontal, Hydraulically Reciprocated, m.d.
No. 182 Barnes Drill, m.d.
No. 854 Micromatic Vertical Honing Machine, m.d.
H1 Micromatic Horizontal Hydrohoner, m.d.
H4 Micromatic Horizontal Hydrohoner, m.d.
No. 306H Barnes Twin Spindle
No. 224B Barnes Honing Machine, m.d.

KEYSEATERS
Taylor & Fenn Horizontal Shaving, Shaping Keyseating, m.d., 1942
W-L-W Machine Keyseater, new

PLANERS
30"x30"x10' Cincinnati, belted m.d., 2 heads
36"x36"x8' Cincinnati, m.d., 2 heads on rail
36"x36"x12' Betts, m.d., 3 heads
36"x36"x12' G. A. Gray, 2 heads
36"x36"x18' table Cincinnati Double Housing, m.d.
36"x36"20' table Cincinnati H.P. Double Housing, m.d., belted
48"x48"x18' Niles-Bement-Pond, 2 heads, belt
48"x48"x28' Cincinnati, reversing m.d., 4 heads
56"x42"x14' Cincinnati, belt drive, 2 heads
48"x48"x12' table Sellers, "Power Flow." Double Housing, m.d.

The above is only a partial listing
WRITE FOR COMPLETE STOCK LISTING

THE EASTERN MACHINERY COMPANY
1006 Tennessee Avenue, Cincinnati 29, Ohio • MElrose 1-1241 • Cable Address EMCO

RE-BUILDING
at its Best

Two of Miles 25 year men scraping in a grinder bed to new tool tierances—one of the many operations which make Miles re-built tools perfrm like new.

BROACH 10 ton 54" STR American dup. vert. hyd. surf.
COILER Cleveland cradle type uncoiler 50"-72" W, 52 dia.
CENTERER 6" x 34" No. 56 Sundstrand dbl. end, new 44
COMPRESSOR 445 CFM Gardner Denver Mod. WBBER"
DRILL 20" No. 217 Baker Bros. hy. dy. box column
DRILLS, HORIZ. Natco dbl. end, new 46, hard ways
DRILLS MULT. 12 spdl. No. 10 DeHaene, rail
DRILLS, MULT. No. 20 HG Baker vert. hyd., late
DRILLS, RADIAL 5'-13" Cincinnati Bickford super service
DRILLS, SENSITIVE 24" No. 3812 Edlund 2 spdl. vri mtr. each spdl.
DRILLS, UPRIGHT 24" Mod. 4BM Fosdick grd hd, PR, FD, GCG, MD, new 54
DRILL 8 spdl. Mod 8LV Davis-Thompson Rotomatic
DUPLICATOR Model BL2416 3 spdl. Pratt & Whitney Keller
GROOVER Wissco continuous, new 53
GEAR CHECKER 20M Fellows "Red Liner" ext.-int., new 43
GEAR GENERATOR 12" Gleason, str. bevel gear-new 43
GEAR PLANER 24" Gleason bevel gear
GEAR HOBBER No. 75 Lees Bradner spl. spdl. 3 HP
GEAR SHAVER Mod. GCC 8" Red Ring, MD, new 40
GEAR CHAMFERER Sheffield Mod. 345 Type C, new 12/47
GRINDERS, CYL. 6" x 30" Cincinnati Filmatic,
GRINDERS, CENTERLESS No. 2 Cincinnati, swivel slide, new 50
GRINDERS, CYL. 6" x 30" Cincinnati Filmatic, plain, new 42
GRINDERS, CYL. 10" x 18" Norton type C, late
GRINDERS, CYL. 12" x 48" Cincinnati Universal, Filmatic
GRINDERS, CYL. 22" x 72" Landis universal
GRINDERS, DISC 24" Model 221 Hanchett opposed dbl. feeder
GRINDER, INTL. No. 72A3 Heald Gagematic, MD
GRINDER, INTL. No. 72A5 Heald hyd. plain, Swvl. hd. new 44
GRINDER, INTL. No. 271 Heald Pl. swvl. wrk. hd. 51
GRINDER, INTL. Bryant No. 24-36 hole, late
GRINDER, SURFACE 12" x 12" x 48" Thompson, hyd.

OVER 1,000 NEW AND USED MACHINE TOOLS IN STOCK
WRITE FOR LATEST STOCK LIST
MILES MACHINERY COMPANY
7045 EAST GENESEE • SAGINAW, MICH. PL. 2-3105

CAPITAL EQUIPMENT LINE WANTED

- Either metal removal or metal forming.
- To complement multiple spindle drilling-tapping-special machine line.
- Led in sales volume in 1958. Latest 1959 report indicated fighting for lead again.
- Manufacturers' agency established in 1950.
- Territory—Central & Southern Illinois and state of Missouri.
- Headquarters—Metropolitan St. Louis.

Contact:
Oscar E. Jost
OSCAR E. JOST COMPANY
P.O. Box 6—St. Ann, Mo.
HArrison 8-4488

WANTED CHIEF ENGINEER
Graduate engineer preferred, or other with comparable experience and background will be considered, to supervise Engineering Department engaged in all phases of design, manufacture, plant layout of foundry equipment, and installation of complete foundry automated molding lines of foundry equipment. Experience and proven background in machine design and foundry operation essential. Send complete resume to Box 728, Machinery, 93 Worth St.

— new 4th printing —
MACHINE TOOL RECONDITIONING
& the Art of Hand Scraping
Send for free folder describing illus. book.
MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., South Wabash St.
St. Paul 1, Minn.

MACHINE TOOLS
No. 2, 4, 5, 1A, 2A Warner & Swasey Preselector Turret Lathes, Bar Feed, Chucking, Swasey Preselector Turret Lathes, Bar Feed, Chucking.
2A BROWN & SHARPE, Hi-Speed Univ. Mill, 1945, 14" x 16" x 60", 24" x 24" x 96".
MATTISON Hyd. Horiz. Surface grinder.
Type 24" Cin. Bickford Super Service Drill Press.
9A Marvel Hack Saw 10" x 10" cap.
3, 3, 6, 8p. 21M5-26" Leland Gifford Drill Press.
FALK-MACHINERY CO.
19 Ward Street — BA 5-5887 — Rochester, N.Y.

NUMERICAL CONTROL "POSITION REGULATORS FOR MACHINE TOOLS"
Reprints of this 12 page section from our November issue, prepared by John Dutcher of General Electric Co., are available for 50 cents each. Send prepaid order to: Promotion Dept.
MACHINERY 93 Worth St., N.Y.

TAKE A LOOK AT YOUR TOOL CRIB

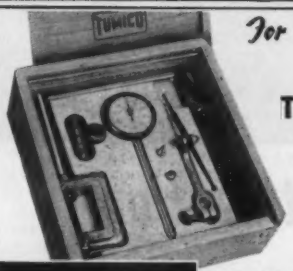
152 Pages
87 Illustrations
$4.00

Does it help – or hinder production?

BETTER TOOL CRIBS gives you detailed descriptions of how such items as milling cutters, honing units, counterbores, fly cutters, measuring tools, gages, machine parts and other shop equipment and materials should be stored. Several complete control systems based on the use of brass tool checks and triplicate tool charge slips are clearly described. A whole chapter is devoted to the step-by-step layout of a complete tool crib, and shows how the maximum benefits can be derived from the proper location of the various pieces of storage equipment and materials stored therein.

The Industrial Press

93 Worth St. **New York 13, N.Y.**



For Precision and Reliability

Tumico "SUPER-SET"

UNIVERSAL PRECISION DIAL TEST INDICATOR SET

Complete Set Now Only $21.50

SCHERR TUMICO

PRECISION MEASURING TOOLS AND INSTRUMENTS

For Complete Information request our 96 Page Catalog — Contact any of our 4 "Coast to Coast" Locations or your nearest Local Distributor.

WAREHOUSE STOCK, SHOWROOMS & SALES OFFICES AT
NEW YORK: 200 Lafayette Street, New York 12, N. Y.
ST. JAMES: St. James, Minnesota
LOS ANGELES: 3337 West Olympic Blvd., Los Angeles 19, Cal.
CHICAGO: 5045 W. Harrison, Chicago 44, Ill.
When writing to any of the above locations, refer to DEPT D-4

For more data circle item 323A on Card

IMPROVE FACING OPERATIONS

ON BORING MILLS - DRILLS - LATHES MILLERS AND RADIALS

M-D facing Head feeds automatically. Lathe tool bit travels radially from center outward or reverse. 10 sizes, 6" to 46" dia. Write for bulletin, prices.

MUMMERT-DIXON CO. 126 Philadelphia St. HANOVER, PA.

For more data circle Item 323B on Card

DO YOU BEND? CUT?

"A MANUAL OF PROCESS for THE COLD BENDING OF METALS and ABRASIVE CUT-MACHINING OF METALS" gives practical advice on all phases of cold bending and abrasive cutting. Simply written by shop men for shop men. Price $3.00.

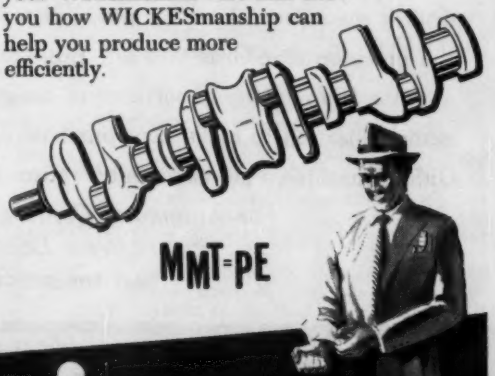
Wallace Supplies Mfg. Co.
1310 West Diversey Parkway Chicago 14, Illinois

For more data circle item 323C on Card

WICKESmanship

"TURNS UP" more profits for your crankshaft production

Here's crankshaft production efficiency that results in lower initial and unit costs for every job . . . guaranteed by an outstanding record of customer satisfaction over the years. Dispensing customer satisfaction is standard procedure at WICKES Machine Tool—and it shows up in the only complete line of CRANKSHAFT LATHES built in the world today. Call your WICKESman—let him show you how WICKESmanship can help you produce more efficiently.

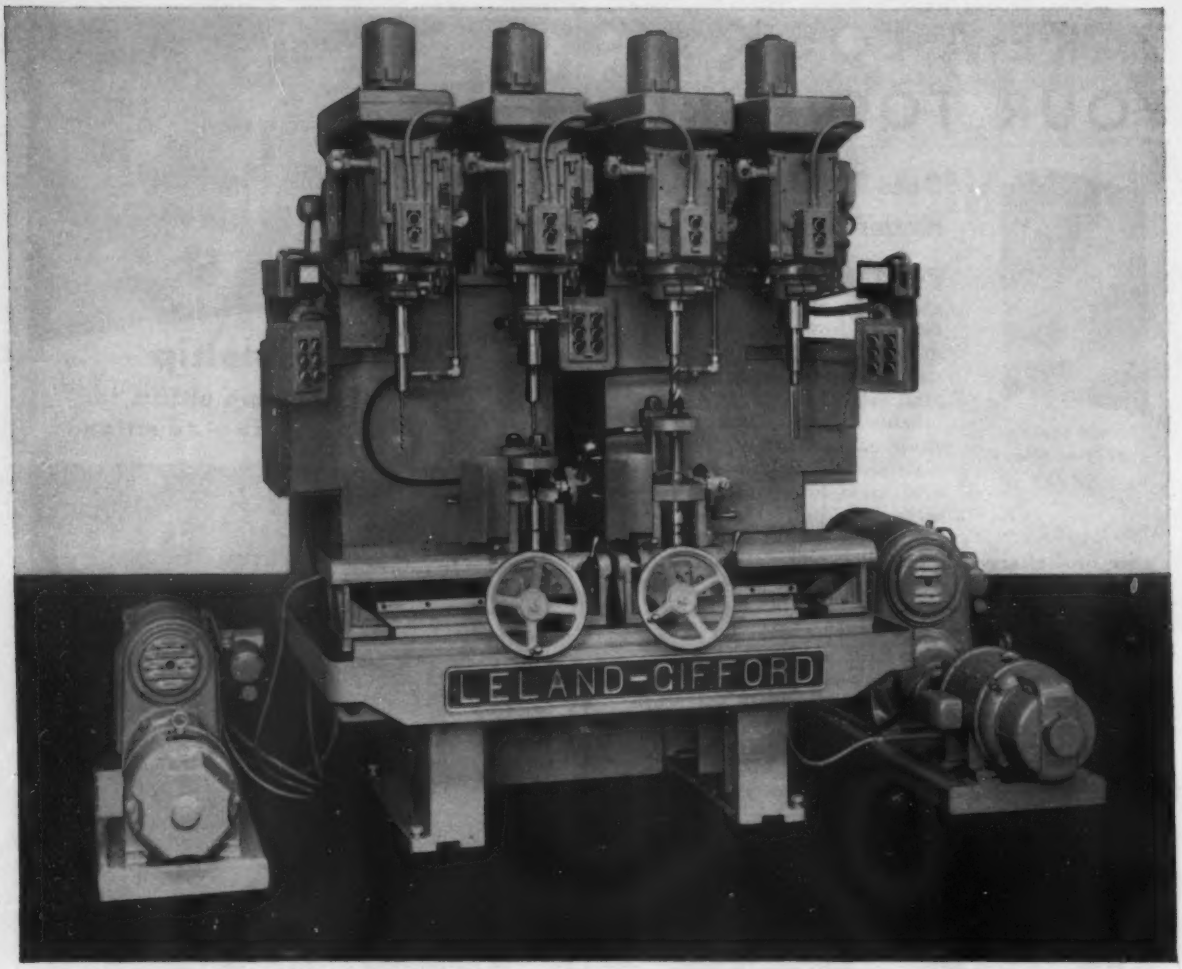


WICKES MACHINE TOOL

DIVISION OF THE WICKES CORPORATION, SAGINAW, MICHIGAN, U. S. A.

CRANKSHAFT LATHES • SMALLEY GENERAL THREAD MILLERS • ENGINE LATHES
CENTER DRIVE LATHES AND BORING MACHINES • SPECIAL MACHINES

For more data circle Item 323D on Card



Designed for maximum utilization —

It goes without saying that Leland-Gifford special drilling machines deliver the production you want to the precision standards you set. But Leland-Gifford also has in mind the importance of design for maximum utilization to make your purchase of a Leland-Gifford machine a gilt-edge, quick return investment.

For Automatic Drilling at its best . . . be sure to see Leland-Gifford

CALL THE OFFICE NEAR YOU

THE JOB: Drill and ream a complete line of screw machine master collets and feed fingers ranging from ⅛" to 1¼" diameter.

THE MACHINE: A dual operating Leland-Gifford special with two work-holding fixtures and four standard self-contained drilling units equipped for either plain or step feed. Workpieces are drilled in one location, indexed to second location and reamed. Spindle speeds are precisely controlled through variable frequency input to ac spindle motors. Hydraulic feed is infinitely adjustable with separate motors driving hydraulic pumps at constant speed regardless of spindle speed.

LELAND-GIFFORD SPECIAL DRILLING MACHINES

WORCESTER 1, MASSACHUSETTS
U. S. A.

Chicago 5
2515 W. Peterson Ave.
Detroit
10429 W. McNichols Rd.
Cleveland 22
P. O. Box 853
New York Office
75 S. Orange Ave.
South Orange, N.J.
Los Angeles Office
2620 Leonis Blvd.
Vernon 58, Cal.
Indianapolis 6, P. O. Box 1051
Rochester 12, P. O. Box 24, Charlotte Station

Alphabetical Index of Advertisers

Ajax Manufacturing Co. 66
Allegheny Ludlum Steel Corp. .. 84
Allen-Bradley Co. .... Insert 95-96
Allen Manufacturing Co. 264
American Brass Co. 232
American Tool Works Co. 127
Ames, B. C., Co. 289
Armstrong-Blum Mfg. Co. 283
Armstrong Bros. Tool Co. 20
Atlas Press Co., Clausing Div. .. 76
Avondale Marine Ways, Inc. 280

Baker Bros., Inc. 110
Barber-Colman Co. ..... Insert 88-89
Barnes Drill Co. 231
Barnes, W. F. & John Co. .. Insert 86
Beatty Machine & Mfg. Co. 276
Beckett-Harcum Co. 278
Bethlehem Steel Co. 41, 267
Blanchard Machine Co. 120
Bliss, E. W., Co. 71
Boston Gear Works 117
Brook Motor Corp. 291
Bruning, Charles, Co., Inc. 97
Bryant Chucking Grinder Co. ... 249
Buck Tool Co. 262
Buffalo Forge Co. 68
Buhr Machine Tool Co. 54-55
Bullard Co. 305
Bunting Brass & Bronze Co. 253

Chambersburg Engineering Co. .. 298
Cincinnati Gear Co. 252
Cincinnati Lathe & Tool Co. .. 52-53
Cincinnati Milling Machine Co., Grinding Machine Div. 6-7
Cincinnati Milling Machine Co., Meta-Dynamics Div. 241
Cincinnati Milling Products Div., Cincinnati Milling Machine Co. 37, 49
Cincinnati Shaper Co. 18-19
Circular Tool Co., Inc. 255
Classified Advertisements 322
Clausing Div., Atlas Press Co. .. 76
Cleco Air Tools Div., Reed Roller Bit Co. 38
Cleveland Automatic Machine Co. 217
Cleveland Crane & Engrg. Co. .. 116
Cleveland Punch & Shear Wks. Co. 303
Cleveland Worm & Gear Co. 265
Columbia Tool Steel Co. 318
Columbus Die-Tool & Mch. Co. .. 284
Cosa Corp. 282
Cross Co. 16-17
Crucible Steel Co. of America .. 28-29
Cushman Chuck Co. 105

Danly Machine Specialties, Inc. 227
Davis & Thompson Co. 268
Delta Power Tool Div., Rockwell Mfg. Co. 285
Denison Engineering Div. ABSCO 42
DeVlieg Mch. Co. 62-63
Diefendorf Gear Corp. 319
DoAll Co. 259
Dykem Co. 319
Dynapak-Convair Div., General Dynamics Corp. 271

Edlund Machinery Co. 106-107
Eisler Engineering Co., Inc. 321
Ex-Cell-O Corp. 113, 223, 239

Fafnir Bearing Co. .... Front Cover
Fairbanks, Morse & Co. 244
Farrand Optical Co., Inc. 326
Federal Bearings Co., Inc. 51
Federal Machine & Welder Co. .. 256
Federal Products Corp. 39
Fellows Gear Shaper Co. 4-5
Fosdick Mch. Tl. Co. 311
Futurmill, Inc. 321

Gardner Machine Co. 21, 25
Geometric-Horton Divs., United Greenfield Corp. .. Insert 77
Gillen, John, Co. 288
Gisholt Machine Co. .... Insert 33-36
Gleason Works 101
Goss & DeLeeuw Mch. Co. 270
Gray, G. A., Co. 22-23
Great Lakes Steel Corp. 60-61
Greaves Machine Tool Co. 260
Greenlee Bros. & Co. ..... Insert 94
Grieder Industries, Inc. 254

Hamilton Tool Co. 297
Hanchett Magna-Lock Corp. 296
Hannifin Co., Div. Parker-Hannifin Corp. .... Insert 67, 312
Hardinge Brothers, Inc. 24, 130
Heald Machine Co., The Inside Front Cover
High Precision Products 291
Hughes Aircraft Co. 212
Hydraulic Press Mfg. Co. 121

Induction Heating Corp. 327
Industrial Press ... 313, 316-317, 320
Innocenti Corp. 83

Jacobs Manufacturing Co. 299
Johansson, I. O., Co. 321
Jones & Lamson Machine Co. ... 295

Kearney & Trecker Corp. 279
Kingsbury Machine Tool Corp. .. 103

L & J Press Corp. 306
Laminated Shim Co., Inc., Stampings Div. 128
Landis Machine Co. 2-3
Landis Tool Co. 8-9
Latrobe Steel Co. 69
LeBlond, R. K. Mch. Tl. Corp. 114-115
Leland-Gifford Co. 324
Lepel High Frequency Laboratories, Inc. 290
Littell, F. J., Mch. Co. 257
Little Giant Pump Co. 315
Logan Engineering Co. 269
Lucas Machine Div., New Britain Machine Co., The .... Insert 79-80

Machine Products Corp. 225
Machine Tool Exposition 44
Macklin Co. 109
Madison-Kipp Corp. 302
Malleable Castings Council 98-99
Marac Machinery Corp. 45
Mattison Machine Works .. Insert 87
Metallurgical Products Dept., General Electric Co. 78
Micromatic Hone Corp. 286-287
Mitts & Merrill 308
Mohawk Tools, Inc. 263
Monarch Machine Tool Co. 30-31
Moore Special Tool Co., Inc. 118
Morris, Robert, E., Co. Inside Back Cover
Mummert-Dixon Co. 323

National Automatic Tool Co., Inc. Insert 46-47
National Broach & Machine Co. 32
National Machine Tool Builders Assoc. 44
National Machinery Co. 294
New Britain Machine Co., The, New Britain-Gridley Machine Div. 122-125
New Jersey Gear & Mfg. Co. ... 321
Niagara Mch. & Tl. Wks. 65
Nice Ball Bearing Co. 126

Oakite Products, Inc. 108
Oliver Instrument Co. 43
Opto-Metric Tools, Inc. 318
Orban, Kurt, Co., Inc. 219

Pangborn Corp. 328
Pannier Corp. 266
Parker Fittings & Hose Div., Parker-Hannifin Corp. .. Insert 67
Parker-Hannifin Corp. Insert 67, 312
Pope Machinery Corp. 250
Pratt & Whitney Co., Inc. (Potter & Johnston Machines) 236-237
Precision Welder & Flexopress Corp. 275

Reliance Electric & Engrg. Co. .. 48
Revere Copper & Brass, Inc. 81
Roberts Electric Co. 315
Rockford Machine Tool Co. Insert 90-91
Rowbottom Machine Co. 104
Rowe Mchry. & Mfg. Co., Inc. .. 319
Russell, Burdsall & Ward Bolt & Nut Co. 228
Ruthman Machinery Co. 294
Ryerson, Joseph, T. & Son, Inc. .. 132

SKF Industries, Inc. 277
Safety Socket Screw Co. 258
Saginaw Steering Gear Div., General Motors Corp. 59
Scherr-Tumico Co. 323
Schrader's A., Son, Div. Scovill Mfg. Co., Inc. 261
Seneca Falls Machine Co. 292
Servo-Tek Products Co., Inc. ... 288
Sheffield Corp. 293
Sheldon Machine Co., Inc. 304
Shenango Furnace Co. 274
Skinner Chuck Co. ..... Insert 57-58
Snyder Corp. 221
Springfield Machine Tool Co. ... 70
Stahl Gear & Machine Co. 315
Standard Electrical Tool Co. 310
Standard Oil Co. (Indiana) ... 26-27
Standard Tool Co. 273
Stuart, D. A., Oil Co., Ltd. Insert 247-248
Sundstrand Machine Tool Co., Div. Sundstrand Corp. Insert 92-93

Texaco, Inc. 82
Textile Machine Works 309
Thomson Industries, Inc. 215
Thriftmaster Products Corp. 111
Timken Roller Bearing Co. .... 112, Back Cover
Tomkins-Johnson Co. 119
Ty-Sa-Man Machine Co., Inc. ... 272

U. S. Drill Head Co. 100
U. S. Tool Co., Inc. 10-11
Universal Engineering Co. 40

Van Keuren Co. 300
Van Norman Machine Co. 14-15
Verson Allsteel Press Co. 301
Vickers, Inc. 102
Vlier Engrg. Corp., Wespo Div. 281

Waldes Kohinoor, Inc. 50
Wales Strippit, Inc. 56
Walker, O. S., Co., Inc. 74-75
Wallace Supplies Mfg. Co. 323
Warner & Swasey Co. 12-13
Waterbury Farrel Fdry. & Mch. Co. 251
Wickes Machine Tool Div., Wickes Corp. 323
Wicaco Machine Corp. 314
Williams, J. H. & Co. 62-63

Yoder Co. 64

Zagar, Inc. 307

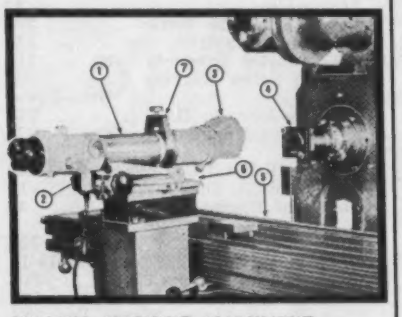
FARRAND OPTICAL TOOLING SYSTEMS

for aligning machines, such as, jig borers, millers, lathes and turbines

■ Farrand alignment telescopes and accessories are now standard equipment for maintenance and inspection. Time-saving, simple to use with greater precision by regular plant personnel.

TYPICAL SHOP APPLICATIONS:

- Adjustment or checking straightness of machinery and machine tool ways.
- Adjustment or checking angular relationship between bed and spindle axis of machinery and machine tools.
- Checking of master squares, parallel bars and angle blocks.
- "Scraping in" or checking flatness of surface plates, machinery and machine tool beds, skin mills and machine beds.
- Alignment and checking of multiple shaft bearings.
- Alignment and control of relative positions of transfer machines during fabrication and assembly process.
- Construction of large jigs and fixtures.
- Alignment of various automatic machines.



MILLING MACHINE ALIGNMENT

Checking the squareness of spindle axis and milling machine bed using Farrand Alignment Telescope (1), with built-in Autocollimator (2), Optical Square (3), Spindle Mirror (4), Magnetic Collimating Mirror (5), Magnetic Kinematic Telescope Mount (6) and Cup Mount Clamp (7).

Angular change of bed with change of bed height can also be determined.

Write for Bulletin No. 808

FARRAND OPTICAL CO., INC.

Bronx Blvd. & E. 238th St., New York 70, N. Y.

free literature guide

Want more information? Below are listed the products described in this issue. Page number after company name refers to location of ad and number to be circled on cards for literature.

This guide is compiled as a convenience to our readers. Every care is taken to keep it accurate. Machinery assumes no responsibility for errors or omissions.

BALANCING MACHINES
Cosa Corp. 282

BAR MACHINES, AUTOMATIC
Cleveland Automatic Mch. Co. . 217

BEARINGS
Fafnir Bearing Co. .. Front Cover
Federal Bearings Co. 51
Nice Ball Bearing 126
SKF Industries 277
Timken Roller Bearing Co. Back Cover

BEARINGS, BRONZE
Bunting Brass & Bronze Co. .. 253

BENDING EQUIPMENT, PIPE & TUBE
Wallace Supplies Co. 323C

BORING MACHINES
Ex-Cell-O Corp. 239
Fosdick Mch. Tool Co. 311
New Britain Mch. Co. 125

BORING MILLS
Gray, G. A. Co. 22-23
Lucas Div., New Britain Mch. Co. 79-80
National Automatic Tool Co. 46-47

BRASS
American Brass Co. 232
Revere Copper & Brass, Inc. .. 81

BROACHING MACHINES
Sundstrand Mch. Tool 92

BUSHES, TENSION
Gillen, John Co. 288B

CAMS
Eisler Engineering Co. 321C
Rowbottom Mch. Co. 104

CARBIDE TOOLS
Allegheny Ludlum, Carmet ... 84

CASTINGS, MALLEABLE
Malleable Castings 98-99

CASTINGS, NON-FERROUS
Shenango Furnace Co. 274

CHUCKING MACHINES, AUTOMATIC
Goss & DeLeeuw Machine Co. . 270
Hardinge Brothers, Inc. 130
New Britain Mch. Co. 122

CHUCKS
Buck Tool Co. 262
Cushman Chuck Co. 105
Hanchett-Magna-Lock Corp. 296
Jacobs Mfg. Co. 299
Skinner Chuck Co. 57-58
Walker, O. S. Co., Inc. 74-75

CLAMPING DEVICES & FIXTURES
Armstrong Bros. Tool Co. 20
Universal Engrg. 40
Vlier Engrg., Wespo div. 281

COLD FORMING EQUIPMENT
Cincinnati Milling, Metadynamics div. 241
Dynapak 271
National Mchry. Co. 294B
Waterbury Farrel Foundry ... 251

COLLETS
Hardinge Brothers, Inc. 24

COOLANT UNITS
Little Giant Pump Co. 315A

CONTRACT WORK
Textile Machine Works 309

CONTROL DEVICES, ELECTRONIC
Hughes Prod. 212

CONTROLS, ELECTRICAL
Allen-Bradley 95-96

COPPER
American Brass Co. 232
Revere Copper & Brass 81

CUTTING & GRINDING FLUIDS
Cincinnati Milling Products div. 37
Stuart, D. A. Oil Co. 247-248
Texaco, Inc. 82

CUTTING OFF MACHINES
Armstrong-Blum Mfg. Co. 283
Grieder Industries, Inc. 254

CUTTING TOOLS
Mohawk Tools, Inc. 263
Standard Tool Co. 273

CYLINDERS
Hannifin Co. 67
Schrader's, A. Son 261
Vickers, Inc. 102

DIE GRINDERS
Cleco div. Reed Roller Bit Co. 38

DRILL HEADS
Thriftmaster Products Corp. .. 111
U. S. Drill Head Co. 100
Zagar, Inc. 307

DRILLING MACHINES
Baker Brothers, Inc. 110
Buffalo Forge Co. 68
Delta Power Tool 285
Edlund Machinery Co. 106-107
Johansson, I. O. Co. 321D
Leland-Gifford Co. 324

DRIVES & DRIVE SYSTEMS
Reliance Electric & Engrg. Co. 48

FACING HEADS
Mummert-Dixon Co. 323B

FASTENERS
Allen Manufacturing Co. 264
Russell, Burdsall & Ward Bolt & Nut Co. 228
Safety Socket Screw Co. 258

FORGING MACHINES
Ajax Mfg. Co. 66

FINISHING & CLEANING EQUIPMENT
Oakite Products, Inc. 108
Pangborn Corp. 328

GAGING & MEASURING EQUIPMENT
Ames, B. C. Co. 289
Ex-Cell-O Corp. 223
Federal Products Corp. 39
Scherr Tumico 323A
Sheffield Corp. 293
Van Keuren Co. 300

GEAR CUTTERS
Fellows Gear Shaper 4-5
National Broach & Mch. Co. .. 32

GEARS
Avondale Marine Ways, Inc. .. 280
Boston Gear Works 117
Cincinnati Gear Co. 252
Diefendorf Gear Corp. 319C
Gleason Works 101
New Jersey Gear Co. 321B
Stahl Gear Co. 315B

GRINDING MACHINES
Blanchard Machine Co. 120
Bryant Chucking Grinder Co. . 249
Cincinnati Grinding Mch. div. 6-7
Gardner Mch. Co. (Disc) 25
Mattison Mch. Works 87
Springfield Mch. Tool Co. 70
Van Norman Mch. Co. 14-15

GRINDING MACHINES, CENTER HOLE
High Precision Products 291B

GRINDING MACHINES, TOOL
Barber-Colman Co. 88-89
Oliver Instrument Co. 43

GRINDING MACHINES, VERTICAL
Heald Mch. Co. Inside Front Cover

GRINDING WHEELS
Cincinnati Milling Products div. 49
Gardner Machine Co. 21
Macklin Co. 109

HONING EQUIPMENT
Micromatic Hone Corp. ... 286-287

HOSE & HOSE FITTINGS
Parker Fittings div. 67A

INDUCTION HEATING EQUIPMENT
Induction Heating Corp. 327
Lepel High Frequency 290

JIG BORERS & GRINDERS
Moore Special Tool Co., Inc. .. 118
Orban, Kurt Co., Inc. 219

JIGS & FIXTURES
Columbus Die-Tool & Mch. Co. 284

JIGMILLS
DeVlieg Mch. Co. 62-63

KEYSEATERS
Mitts & Merrill 308

LATHES
American Tool Works Co. 127
Bullard Co. 305
Cincinnati Lathe & Tool Co. 52-53
Clausing div., Atlas Press Co. 76
Jones & Lamson Mch. Co. 295
LeBlond Mch. Tool Co. ... 114-115
Logan Engineering Co. 269
Monarch Mch. Tool Co. 30-31
New Britain Mch. Co. 122
Pratt & Whitney Co. 236-237
Seneca Falls Mch. Co. 292
Sheldon Machine Co., Inc. 304
Sundstrand Mch. Tool 92
Warner & Swasey Co. 12-13
Wickes Mch. Tool div. 323D

LAYOUT FLUID
Dykem Co. 319B

LUBRICANTS
Standard Oil Co. (Indiana) 26-27

LUBRICATING SYSTEMS
Madison-Kipp Corp. 302A

MARKING DEVICES
Pannier Corp. 266

MICRON SECTIONS
Ex-Cell-O Corp. 113

MILLING MACHINES
Greaves Machine Tool Co. 260
Kearney & Trecker Corp. 279
Marac Machinery Co. 45
Nichols, W. H. Co. Inside Back Cover
Sundstrand Mch. Tool 93

MILLS, TUBE & PIPE
Innocenti 83

MOTORS
Brook Motor Corp. 291A

OIL GROOVING MACHINE
Wicaco Mch. Co. 314

OPTICAL TOOLING SYSTEMS
Bruning, Charles Co. 97
Farrand Optical Co., Inc. 326

PLANERS
Rockford Mch. Tool Co. 90-91

PRESSES
Beatty Mch. & Mfg. Co. 276
Bliss, E. W. Co. 71
Cleveland Punch & Shear 303
Danly Mch. Specialties 227
Denison Engineering Div. 42
Hannifin Co. 312
Hydraulic Press Mfg Co. 121
L & J Press Corp. 306
Niagara Machine & Tool Works 65
Precision Welder & Flexopress 275
Steelweld div. Cleveland Crane 116
Verson Allsteel Press Co. 301

PRESS BRAKES & SHEARS
Cincinnati Shaper Co. 18-19

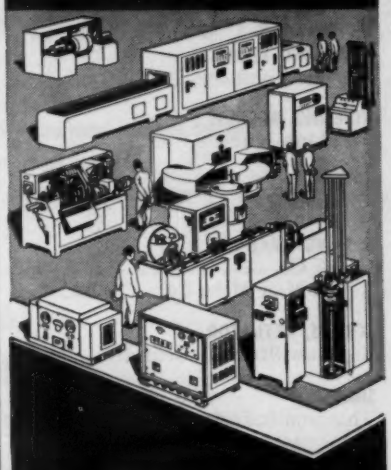
PRESS FEEDING EQUIPMENT
Beckett-Harcum Co. 278
Littell, F. J. Mch. Co. 257
Rowe Machinery & Mfg. Co. 319A
U. S. Tool Co., Inc. 10-11

PRESSES, FORGING (HAMMER)
Chambersburg Engrg. Co. 298

PUMPS
Fairbanks, Morse 244
Ruthman Machinery Co. 294A

PUNCHING EQUIPMENT
Wales Strippit, Inc. 56

for HARDENING • BRAZING
SOLDERING • FORGING • ANNEALING
MELTING • SINTERING • WELDING
REFINING • SHRINK FITTING
CRYSTAL GROWING



THER-MONIC

Manufactures the most complete range of

INDUCTION HEATING EQUIPMENT

ELECTRONIC - LOW FREQUENCY
MOTOR GENERATOR

THER-MONIC features

• Over 20 years of concentrated experience.

• Over 5,000 installations.

• Over 15,000 heating applications resolved in our customer service laboratories.

• This outstanding experience and know-how qualify us to prescribe the techniques and equipment best suited for your requirement.

Contact our factory or your local IHC representative.

Write for New 56-page catalog of exclusive features, facts and specs.

INDUCTION HEATING CORP.
181 WYTHE AVE., BROOKLYN 11, N. Y.

free literature guide

Want more information? Below are listed the products described in this issue. Page number after company name refers to location of ad and number to be circled on cards for literature.

(*Continued from page 327*)

RETAINING RINGS
Waldes Kohinoor, Inc. 50

RIVETING MACHINE
Tomkins-Johnson Co. 119

SAWS
Circular Tool Co., Inc. 255

SAWING MACHINES
DoAll Co. 259
Ty-Sa-Man Mch. Co. 272

SCREWS, ACTUATOR
Saginaw Steering Gear div. 59

SHAFTS
Thomson Industries, Inc. 215

SPEED INDICATORS
Servo-Tek Prod. Co. 288A

SPEED REDUCERS
Cleveland Worm & Gear Co. .. 265

SPINDLES
Pope Machinery Corp. 250
Standard Electrical Tool Co. .. 310

STAMPINGS
Laminated Shim Co. 128

STEEL
Great Lakes Steel 60-61
Ryerson Steel 132

STEEL, TOOL & DIE
Crucible Steel Co. 28-29
Latrobe Steel Co. 69
Timken Steel 112

TABLES, PORTABLE ELEVATING
Hamilton Tool Co. 297

TABLES, ROTARY INDEXING
Machine Products Corp. 225
Opto-Metric Tools, Inc. 318A

TAPS & DIES
Geometric-Horton 77

THREADING EQUIPMENT
Landis Mch. Co. 2-3

TOOL HOLDERS
Metallurgical Products Dept. 78

TOOLS, HAND-WRENCHES, Etc.
Williams, J. H. & Co. 62-63

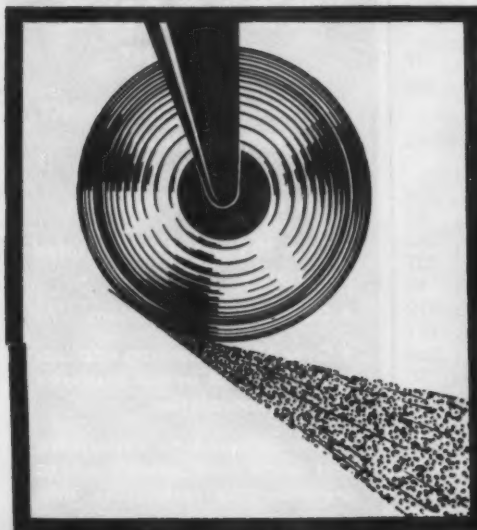
TRANSFER MACHINES, MULTI-UNIT
Barnes, W. F. & John Co. 86
Barnes Drill Co. 231
Buhr Mch. Tool Co. 54-55
Cross Co. 16-17
Davis & Thompson Co. 268
Greenlee Bros. & Co. 94
Kingsbury Mch. Tool Corp. .. 103
Snyder Corp. 221

TRANSMISSIONS, HYDRAULIC
Roberts Electric Co. 315C

TUBE MILLS
Yoder Co. 64

VALVES
Hannifin Co. 67
Vickers, Inc. 102

WELDING EQUIPMENT
Federal Mch. & Welder 256
Precision Welder & Flexopress 275



To cut your blast cleaning costs . . .

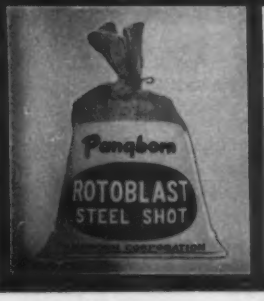
Pangborn

CLEANS IT FAST WITH

ROTOBLAST®

MACHINES AND ABRASIVE

BARRELS • CONTINUOUS-FLO® BARRELS • CABINETS • TURN-STYLE TABLES • ROOMS • TABLES • TABLE-ROOMS • SPECIAL MACHINES • ABRASIVES



Today hundreds of cleaning rooms across the country use high-capacity Rotoblast units in Pangborn machines for Rotoblasting castings, forgings, super alloys, etc., and descaling hot rolled steel. To learn how Rotoblast can help *you,* write PANGBORN CORPORATION, 1200 Pangborn Blvd., Hagerstown, Md. ***Manufacturers of Blast Cleaning and Dust Control Equipment—Rotoblast Steel Shot and Grit.***®

Find sources for more data, quickly, easily. Use MACHINERY'S free literature guide on preceding pages. Advertisers in this issue are listed alphabetically by product. Page numbers following company names indicate both location of ad and number to be circled on cards for more data.

feel free to use cards below . . .

to obtain free literature on products advertised or described in this issue

1. Circle page numbers of advertisements—if no page number appears on ad refer to advertisers' index or free literature guide.
2. Circle item numbers of new equipment, catalog descriptions.
3. Mail . . . we'll do the rest.

For Advertisements—Circle Page Numbers

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	67A	68	69	70	71
73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96
97	98	99	100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132
212	215	217	219	221	223	225	227	228	231	232	236
237	239	241	244	247	248	249	250	251	252	253	254
255	256	257	258	259	260	261	262	263	264	265	266
267	268	269	270	271	272	273	274	275	276	277	278
279	280	281	282	283	284	285	286	287	288A	288B	289
290	291A	291B	292	293	294A	294B	295	296	297	298	299
300	301	302A	303	304	305	306	307	308	309	310	311
312	313	314	315A	315B	315C	316	317	318A	319A	319B	319C
320	321A	321B	321C	321D	323A	323B	323C	323D	324	326	327
328	708	709	710	711	712	713	714				

COVERS: FRONT — INSIDE FRONT — INSIDE BACK — BACK

For New Equipment, Catalogues—Circle Item Numbers

501	502	503	504	505	506	507	508	509	510	511	512
513	514	515	516	517	518	519	520	521	522	523	524
525	526	527	528	529	530	531	532	533	534	535	536
537	538	539	540	541	542	543	544	545	546	547	548
549	550	551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569			
570	571	572	573	574	575	576	577	578	579	580	581
582	583	584	585	586	587	588	589	590	591	592	593
594	595	596	597	598	599	600	601	602	603	604	605
606	607	608	609	610	611	612	613	614	615	616	617
618	619	620	621	622	623	624	625	626	627	628	629
630	631	632	633	634	635	636	637	638	639	640	641
642	643	644	645	646	647	648	649	650	651	652	653
654	655	656	657	658	659	660	661	662	663	664	665
666	667	668	669	670	671	672	673	674	675	676	677
678	679	680	681	682	683	684	685	686	687	688	689
690	691	692	693	694	695	696	697	698	699		

Please print 4/60

NAME .....

TITLE .....

COMPANY .....

CO. ADDRESS .....

CITY ..... ZONE .... STATE .....

For Advertisements—Circle Page Numbers

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	67A	68	69	70	71
73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96
97	98	99	100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132
212	215	217	219	221	223	225	227	228	231	232	236
237	239	241	244	247	248	249	250	251	252	253	254
255	256	257	258	259	260	261	262	263	264	265	266
267	268	269	270	271	272	273	274	275	276	277	278
279	280	281	282	283	284	285	286	287	288A	288B	289
290	291A	291B	292	293	294A	294B	295	296	297	298	299
300	301	302A	303	304	305	306	307	308	309	310	311
312	313	314	315A	315B	315C	316	317	318A	319A	319B	319C
320	321A	321B	321C	321D	323A	323B	323C	323D	324	326	327
328	708	709	710	711	712	713	714				

COVERS: FRONT — INSIDE FRONT — INSIDE BACK — BACK

For New Equipment, Catalogues—Circle Item Numbers

501	502	503	504	505	506	507	508	509	510	511	512
513	514	515	516	517	518	519	520	521	522	523	524
525	526	527	528	529	530	531	532	533	534	535	536
537	538	539	540	541	542	543	544	545	546	547	548
549	550	551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569			
570	571	572	573	574	575	576	577	578	579	580	581
582	583	584	585	586	587	588	589	590	591	592	593
594	595	596	597	598	599	600	601	602	603	604	605
606	607	608	609	610	611	612	613	614	615	616	617
618	619	620	621	622	623	624	625	626	627	628	629
630	631	632	633	634	635	636	637	638	639	640	641
642	643	644	645	646	647	648	649	650	651	652	653
654	655	656	657	658	659	660	661	662	663	664	665
666	667	668	669	670	671	672	673	674	675	676	677
678	679	680	681	682	683	684	685	686	687	688	689
690	691	692	693	694	695	696	697	698	699		

Please print 4/60

NAME .....

TITLE .....

COMPANY .....

CO. ADDRESS .....

CITY ..... ZONE .... STATE .....

information center

Reverse side of this card gives instructions on how to use postcards below to obtain new catalogs, data on new equipment described, and products advertised in this issue. In the Free Literature Guide immediately preceding these cards advertisers are listed by product group to facilitate location of advertisements on which you desire additional data and catalogs.

This card expires July 1, 1960

FIRST CLASS
Permit No. 53
New York, N. Y.

BUSINESS REPLY MAIL
No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY

MACHINERY
93 WORTH STREET
NEW YORK 13, N.Y.

READERS' SERVICE DEPT.

This card expires July 1, 1960

FIRST CLASS
Permit No. 53
New York, N. Y.

BUSINESS REPLY MAIL
No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY

MACHINERY
93 WORTH STREET
NEW YORK 13, N.Y.

READERS' SERVICE DEPT.

BOOKS LIKE THESE ARE RELIABLE TOOLS THAT CAN HELP YOU IN YOUR WORK!

Order Them by Mail

MACHINERY'S HANDBOOK—16th Edition

A modern handbook is a necessity for every man who holds or hopes to hold a responsible job in the mechanical industries. This one is the "Bible" of them all. The latest edition of this world-renowned book combines all the valuable features of earlier editions with the most recent and useful machine-designing and machine-shop data obtainable. 192 pages added to 15th Edition. Over 500 completely new pages of reference data. 2104 Pages, Thumb Indexed.

$11.00

THE USE OF HANDBOOK TABLES AND FORMULAS

A companion book for users of MACHINERY'S HANDBOOK which shows you how to get the most out of your Handbook. Examples, solutions and test questions show typical applications of Handbook matter in both drafting-rooms and machine shops.

$2.00 Special combination price with MACHINERY'S HAND BOOK, $12.50

DIE-CASTING—2nd Edition

by Charles O. Herb

Illustrates and describes the latest die-casting machines. Tables of die-casting alloy compositions, the latest developments, discussion of their properties and applications. 196 Illustrations. 310 Pages.

$5.00

MATHEMATICS AT WORK

by Holbrook L. Horton

100 pages of reviews of the fundamentals of arithmetic, algebra, geometry, trigonometry and logarithms. 482 pages of illustrated mechanical problems with step-by-step analyses and solutions. 146 pages of standard mathematical tables needed for all types of problem solving. 196 Illustrations.

$7.50

MACHINE TOOLS AT WORK

2nd Edition—by Charles O. Herb

Applications of standard and special machine tools, with data on speed, feed, production, etc. Covers turning, thread milling, thread grinding, drilling, tapping, boring, punching, riveting, planing, shaping, broaching, honing, superfinishing and much more. 584 pages, 434 illustrations.

$6.50

GEAR DESIGN SIMPLIFIED

by Franklin D. Jones

In chart form. Contains 110 gear-problem charts and worked-out examples of gear design that show exactly how rules are applied in obtaining essential dimensions, angles, or other values. 201 Drawings. 134 Pages.

$4.50

More Books Described On Reverse Side

INGENIOUS MECHANISMS FOR DESIGNERS AND INVENTORS

Volumes I and II by Franklin D. Jones. Volume III by Holbrook L. Horton

A comprehensive encyclopedia of mechanical movements unparalleled in scope and usefulness. Each volume is an independent treatise. Similar in size and general character, the contents are different. Tells *what* each mechanism consists of, *how* it operates, and the features which make it of special interest. Hundreds of illustrations.

Single Volume, $6.50

Complete Set, $16.00

ENGINEERED WORK MEASUREMENT

by D. W. Karger and F. H. Bayha

Comprehensive treatise on solving problems of Method-Time Measurement (MTM) and Time and Motion Study, to establish efficient procedures. History, fundamentals, mathematics, applications, standards of MTM. Complete tables and official MTM working data card. 120 Illustrations. 630 Pages.

$12.00

MANUAL OF GEAR DESIGN—3 Vols.

by Earle Buckingham

Vol. I: mathematical tables, especially applicable to gear design. Vol. II: simple formulas and time-saving tables for solving spur and internal gear designing problems. Vol. III: formulas, charts and tables used in designing helical gears for parallel shaft drives and "spiral" gears for non-parallel, non-intersecting shafts.

Complete Three-Volume Set, $12.50

Any Single Volume, $5.00

HELICAL SPRING TABLES

by John D. Gayer and Paul H. Stone, Jr.

Index of over 6800 ready-designed compression and tension springs from which selections may be made with minimum calculation. 165 Pages.

$5.00

DIE DESIGN AND DIEMAKING PRACTICE

3rd Edition—by Franklin D. Jones

Drawings and descriptions of a tremendous variety of dies and a vast amount of data to help you avoid expensive mistakes and delays. A standard reference work in the metal-working industries, used by some 40,000 diemakers, designers and tool engineers. 661 Illustrations. 1083 Pages.

$10.00

DIMENSIONS AND TOLERANCES FOR MASS PRODUCTION

by Earle Buckingham

An analysis of the many problems of dimensioning with tolerances for mass production, showing their effect on tool design, gage design, production and inspection, and suggesting improved methods and practices to solve these problems. 179 Illustrations. 164 Pages.

$8.00

MACHINE TOOLS—What They Are and How They Work

by Herbert D. Hall and Horace E. Linsley

Introduction to fundamentals of mass production. Covers each machine tool, how and where it functions, skills and organization that make modern mass production possible. A basic, thorough text on all phases of metalworking operations. 363 Illustrations. 488 Pages.

$5.50

APPLIED ELECTRICITY—4th Edition

by H. Cotton

Elementary text for first course in colleges and technical schools. Ideal for home study. Covers basic principles; contains diagrams, examples and problems. 387 Illustrations. 476 pages.

$5.00

Use this handy order card to order your books.
Mail it today postage-free.

FIRST CLASS
Permit No. 53
New York, N. Y.

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed in the United States

POSTAGE WILL BE PAID BY

THE INDUSTRIAL PRESS
93 WORTH STREET
NEW YORK 13, N. Y.
BOOK DEPT.

PUT THE FACTS AND FIGURES YOU NEED AT YOUR FINGERTIPS — WITH BOOKS!

Order Them by Mail

ENGINEERING ENCYCLOPEDIA

by Franklin D. Jones

Condensed and practical information on 4500 subjects definitions of numerous terms used in engineering and manufacturing practice, the results of many costly and important tests and experiments. No single work will give you a broader knowledge with less reading effort. 206 Drawings. 1431 Pages.

NOW in ONE Volume, $10.00

MACHINERY'S MATHEMATICAL TABLES

Edited by Holbrook L. Horton

This book has been serving mechanical engineers, machine designers, draftsmen, toolmakers, machinists and students for over 30 years! Now it is available in a greatly enlarged version, containing the authoritative, easy-to-use mathematical tabular information you need on the job. Designed for speed and utility. 254 pages.

$3.75

PIPE AND TUBE BENDING

by Paul B. Schubert

Defines the six basic ways by which the bending of ferrous and non-ferrous pipe and tube may be accomplished. Descriptions of methods, applications, and features of the equipment available. 159 Illustrations. 183 Pages.

$6.00

JIG AND FIXTURE DESIGN

by Franklin D. Jones

A thorough coverage of the principles of development and constructional details of jigs and fixtures. Designs show principles of construction that can be applied successfully to a variety of jig and fixture design problems. 345 Illustrations. 406 Pages.

$5.00

QUALITY CONTROL

New 4th Edition—by Norbert L. Enrick

Principles and techniques for everyday use. Shows manufacturers how to improve average quality of products and save money. Explains use of statistics for establishing tolerances which are applied to dimensions of components and assemblies as well as tolerances for non-dimensional quantities. Shows step-by-step improvement in long-run production operations. 216 pages.

$5.50

INSPECTION AND GAGING—2nd Ed.

by Clifford W. Kennedy

The specific functions of manual and automatic measuring devices and gages, the techniques of using them. Analyzes the methods and duties of the different types of inspectors. Ideal for use in the plant or as training course text. 345 Illustrations. 522 Pages.

$9.00

HYDRAULIC AND PNEUMATIC POWER FOR PRODUCTION

by Harry L. Stewart

Contains information on fluid-power circuits, types of equipment and operational details useful to designers, buyers, installers and operators of hydraulic and pneumatic equipment. Describes step-by-step how air and oil equipment can be applied to the manual and automatic operations of all types of production machinery. 348 Illustrations. 416 Pages.

$8.50

SELLING TO INDUSTRY

by Bernard Lester

64 articles on how you can do a better sales engineering job. Covers the problems encountered in selling industrial products or services and discusses successful selling techniques. Case histories. 255 pages.

$4.00

BETTER TOOL CRIBS

by William Raisglid

How to organize and operate an efficient tool crib with maximum benefits. How to avoid wasteful, haphazard methods of tool crib operation. Complete control systems based on the use of brass tool checks and triplicate tool charge slips are clearly described. 87 Illustrations. 152 Pages.

$4.00

MACHINE SHOP TRAINING COURSE

by Franklin D. Jones

Contains 1124 pages of questions and answers, shop problems and solutions, blueprint reading charts. Illustrated by 572 drawings and photographs. For use as a textbook or for designers and production engineers who want the fundamentals of machine shop practice.

Two-Volume Set, **$9.00**

Single Volume, **$5.50**

INDUSTRIAL LUBRICATION PRACTICE

by Paul D. Hobson

Practical working manual covering motors, engines, turbines, compressors, refrigeration equipment, machine tools, pneumatic and hydraulic tools, and other industrial and marine equipment. Chapters on oil purification and reclamation, use of cutting fluids, and storage preservation of machinery. 167 Illustrations. 534 Pages.

$8.00

GEAR RATIOS FOR 4- 6- AND 8-GEAR COMBINATIONS

by Earle Buckingham

Simple method for determining sets of 4-, 6- and 8-change gears to meet precision gear ratio requirements. Features tables of pairs of consecutive factorable numbers from 1000 to 40,000, their ratios and reciprocal ratios to use in making 4-, 6- and 8-gear combinations. 95 Pages.

$5.00

DRAFTSMAN'S MATHEMATICAL MANUAL

by Franklin D. Jones

Draftsmen supplied, out of their daily experiences, this useful collection of classified problems and solutions. Contains principles of algebra, equations, problems involving unknown angles, solution of triangles to determine linear dimensions, calculating unknown diameters or radial dimensions, and general engineering and designing problems. 249 pages.

$3.50

Use the postpaid card below to order the books you want. We will bill you later. Remember, you save postage charges on the books when you send payment in full with your order.

THE INDUSTRIAL PRESS, 93 Worth Street, New York 13, N. Y.

Please send me the following books.

☐ Bill me. ☐ Bill company ☐ Payment enclosed, send books postpaid.

Orders from foreign countries, except Canada, must be accompanied by payment in full including 50¢ per book, postage and handling.

. . . . . .

. . . . . .

. . . . . .

. . . . . .

NAME . . . . . .

COMPANY . . . . . .

COMPANY ADDRESS . . . . . .

CITY . . . . . ZONE . . . . . STATE . . . . . .

HOME ADDRESS . . . . . .

CITY . . . . . ZONE . . . . . STATE . . . . . .

(please fill in home address only if you want books sent there)

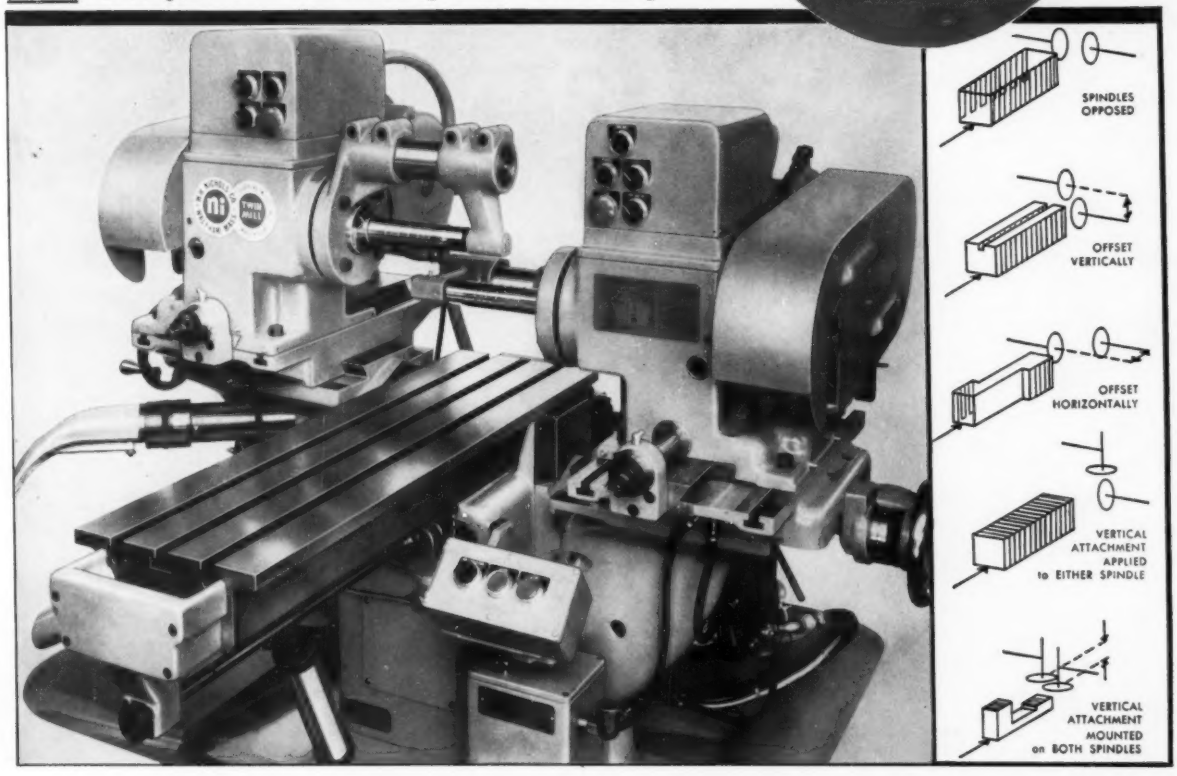
M/4/60

More Books Described On Reverse Side

NOW MORE POWER MORE RANGE

NICHOLS TWIN MILL

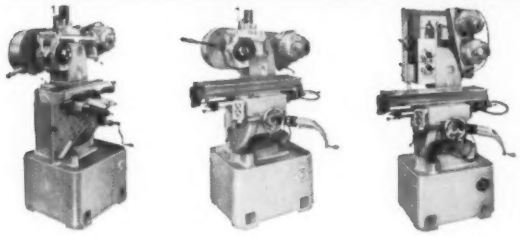
PLUS Unequalled Versatility and Accuracy



Now, the versatile Nichols Twin Mill is available with wider, heavier 36" table for greater work capacity, and 2 HP motor drive to each milling head for greater cutting capacity. Along with increased range and power the Twin Mill is equipped with a fail-safe electrical system which automatically returns all the power feeds to their starting positions in the event of a power failure

Twin Mill features that have built its reputation:

- Unique **six-way** adjustability of each milling head for fast set-up
- Automatic cutter retraction on table return stroke
- Double table cycling allows rough and finish cuts at one set-up
- Push-button controlled automatic air-hydraulic variable table feed cycle
- Automatic lubrication of table ways
- Fifteen speeds from 50 to 2050 RPM — suitable for all materials
- Vertical Heads for either or both horizontal spindles



Write for details on the complete Nichols line, "The Millers that Use Their Heads"
Sound, color, 16mm. movie "The Millers that Use Their Heads" available on free loan basis.

MANUFACTURED BY W. H. NICHOLS COMPANY

National Distributors **REM SALES INC.**

subsidiary of The Robert E. Morris Company

5002 FARMINGTON AVENUE • WEST HARTFORD 7, CONN.

THERE are two big reasons why the trade-mark "Timken" guarantees top bearing value. 1.) It assures you of uniform high quality and performance. From the steel right through to final inspection, Timken® bearings are made to the industry's most exacting specifications. 2.) You're assured of the finest bearing service available.

"Timken" is the registered trade-mark that identifies tapered roller bearings, fine alloy steels and removable rock bits made by The Timken Roller Bearing Company. For your guarantee of value, specify "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

BETTER-NESS rolls on

TIMKEN®

tapered roller bearings